The Chemical Age

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Notes and Comments

Of Food, Enough?

THE odds are that, ere long, we may be forced to extend the grace

> Of rabbit hot, of rabbit cold,
> Of rabbit young, of rabbit old,
> Of rabbits tender, rabbits tough,
> Oh thank the Lord, I've had enough.

The Food Group of the Society of Chemical Industry should soon have advertised itself to supersaturation point; maybe, then, a natural reaction will set in and its leaders retire to Einstein lighthouses. It should be set upon nothing less than a rock. Taking only its star turns—beginning at Newcastle-upon-Tyne, at the summer annual meeting of the Society, with an incongruous quatrain of milk, bread, meat and fertilisers; at the opening of the winter session, the Group engaged in a symposium on Diet, at a joint meeting with the Physiological Society. Four items having been found far too many at Newcastle, eight were presented at this meeting. Next came a welcome relief, the Jubilee lecture recently delivered by Dr. Lampitt, in London, which certainly was neither a work of supererogation nor of jubilation but a courageous and statesmanlike admission of the prevailing ignorance. Now, as we are oureslves in the throes of delivery, the Food Group is running a Grand International Bread-and-Milk Sweepstakes, with fourteen mounts but in three heats, followed by a banquet, under Ministerial patronage, at the Trocadero. Last week, also, on the Tuesday, a Wine and Food Society was declared open at a largely attended Alsatian Luncheon at the Café Royal. On the following Friday, the Biochemical Society celebrated its 21st birthday by dining, in state, at the Hyde Park Hotel, under the chairmanship of Sir F. Gowland Hopkins. This week, Lord Leverhulme has received the Institution of Chemical Engineers at the Waldorf, aided, we assume, by Drikold, in preparation for a dinner and dance, at which all sorts and conditions of chemists will assimilate, at the Great Central Hotel, next Tuesday. It cannot be said of chemists that they do not practise the interactions of which they preach.

Bishops and Brewers

THE Church too has looked in. Led by their Primate, though not yet sufficiently down to the brass tacks of food to know that the belly comes before righteousness in housing, the bishops are discussing Beer and would dishouse this as the drink of the Devil. The while the brewers, jealous that they are not Stout, are not only seeking to cajole the public through Press and poster but, so we are assured, they would even coerce the Press to support them in their wicked ways. Of course, the Press is officially indignant, so sufficiently admits the soft impeachment, giving the brewers what they want. Fortunately for them too a bright spectre has appeared in their Brocken, in the guise of a bishop's aged mother, hale and hearty at 96, notwithstanding her regular indulgence in two full glasses of claret a day. So long as there are women so brave and sensible as this one, we may hope to steer clear of bishops' Hitler-Rooseveltism; the Wine and Food Society should offer her the V.C. of honorary membership. If only a few more bishops can discover mothers so worthy to be proclaimed leaders of public morals, the Church may yet be saved to the nation. As beer was relegated to a committee, nothing more will be done: all causes are lost when so treated, as witness the attempt to rally chemists to a common standard—also the League of Nations. A rift in the lute is Professor Armstrong, who has dared to speak publicly of water *as a safe drink*—although hitherto he has put beer alone into this category: he now sees, with the bishops, that to buy safety with its aid costs too much. He will do anything, it seems: discussing Food at the opening of their school, at the Pharmaceutical Society, he prescribed greens as the future diet of druggists.

The medical Press has not only noticed some of the meetings referred to in snappy terms but has itself recently made two invaluable contributions, one by Sir Robert McCarrison, on Food in relation to Goitre; the other, by Professor Mellanby, on Nutrition and Child Bearing ("Lancet," November 18). The moral of the latter is that prospective mothers should be fed from the outset: the lecture should be in everyone's hands and it may also serve as an example to the Food Group. Our present ignorance and unconcern in all matters of food is a disgrace to our civilisation and a menace to the future.

The Food Group

Dr. LAMPITT has striven manfully to make his Section of avail but all must know that he would never allow a dinner menu to be arranged with the same lack of proportion as are the programmes of the Group. He needs to engage a real chef and put his Tweenies into their place, or, better, substitute for them a bevy

of eight Group mannequins in cooks' attire; he may save the situation if he tour the country with these—otherwise the shutters will go up. We are inclined to think that the meeting at the School of Hygiene was intended only as a Revue, as early in the piece a comic character, who obviously came straight from Austin Reeds, on mounting the rostrum, proclaimed himself " neither chemist nor physiologist but only an analyst and biochemist," forthwith justifying the self-analysis. The actor who presented Obesity was good. Otherwise the play was very dull, only enlivened towards the end by Professor Pembrey, who brought a breath of fresh country air into the smoke laden pernicious atmosphere of the hot theatre—appearing as a Chawbacon with a milk pail, to explain the composition of its contents, in ordinary practice, advising us in our own interests to eat our peck of dirt. The play too was staged in a comfortless, whited sepulchre; the actors were nearly all in need of elocution lessons. Relief came from the chairman's happy smile, throughout the performance, as he balanced himself upon a horizontal bar, delicately poised at the end of a smouldering and appropriately robust scaffold pole.

Wine and Food

THE object of the new Society is to raise the standard of eating and drinking throughout the country—by practice, not by preaching. What an example to the Food Group! What a contrast the luncheons and dinners should be to dreary debates, leading nowhere. Cats, rats and mice will all be out of hearing: sensitive and sensible men and women will be the *Versuchsthieren*. If the Society succeed, men and women generally will be led once more to take an interest in their food—they will demand and secure the needed variety and quality. The way in which we now suffer anything at the hands of the food purveyors is beyond belief. At the Biochemical Society's dinner, the modicum of blanched salad was patently asking: Where's my A? Just as the uncooked fish is often offered for inspection and choice, so should the salad be, as part of the dinner ritual, to mark its importance. That we allow a few chips of canned, unripe Californian peach, with other fruit trimmings, to be put upon our plates as the sweet, is an outrage upon our intelligence, our pockets and our stomachs; even worse is the parboiled, canned mess now too often served as grape fruit. These are some of the abuses the Wine and Food Society must remedy; English fruit growers must rally as one man to its support. The Food Group should profit greatly from its social counterpart; the Group has made its lane long, let us hope the turning is near. All success to its efforts.

Manufacturers' Liability

THE legal case reported in our last issue in which, following the contraction of fur dermatitis from a dyed fur trimming, a whole chain of manufacturers ending with the maker of the dye was involved in a claim for damages, raises important questions. There is the general principle involved as to the extent to which one of several parties should be held responsible. It does not, in the present instance, appear to be disputed that medical opinion finds that dyes with an aniline base are apt to be poisonous internally and deleterious externally. That is not, perhaps, the universal rule; it is a tendency dependent for its potency upon the physiological characteristics of the subject. We do not believe that tendency is generally known. It is hardly likely therefore, that any of the firms involved in the process would have consciously used a dangerous chemical.

There are many uses to which an aniline dye can be put that can never cause damage or illness. Having made a product to the best of his ability and sold it under legitimate conditions, can the dye manufacturer forbid the user to employ it for any specific purpose? We should doubt it; much business would be impossible if the purchaser were to be compelled to state how and where each product bought was to be used. Now take the case to the *reductio ad absurdum*. Let us suppose a man buys arsenious oxide from a chemists shop and poisons himself with it. Can the widow then proceed against the manufacturer on the ground that, taken in the quantities that were actually eaten, arsenic is poisonous and therefore the manufacturer must pay damages? The case referred to raises the general point as where the responsibility should cease, in any similar action. There must be onus upon a manufacturer to describe his goods correctly and to supply the commercial article to which his description applies; once he has done that his responsibility should cease. If the law proves to be otherwise, no doubt the Association of British Chemical Manufacturers will have something to say on the subject.

Alloy Steels

NOW that there are scores of alloy steels available —English, European and American—the task of selecting those few that will serve your purpose best and trustworthily is not an easy one. The manufacturers of such steels claim to give you practical and unbiased help, but it is doubtful if they can be truly unbiased, for as manufacturers they could also be good salesmen to favour products of rival manufacture. The chemical engineer may or may not be unbiased; if he serves the industry faithfully he will favour no one particular producer or product except for good reason of satisfactory experience. He must also be aware of the common causes of failure, and of the precautions to be exercised when fabricating steel into tanks, pressure vessels and similar equipment. In those cases where welding is used for jointing the sheets, it will be necessary to guard against corrosion and embrittlement, and care will have to be exercised in selecting the welding method. The position of the weld is also important; it must be out of reach of stresses which are produced by breathing action or movement. This simple precaution reduces the need for repairs.

The Bureaucrats

THE farmer fears a plague of rats,
The angler's worried by swarms of gnats,
Birds are in daily dread of cats,
Nurses are nagged by peevish brats.
But worse than rats, gnats, cats or brats,
For the hapless victims of rate or tax,
Is the growing army of bureaucrats.

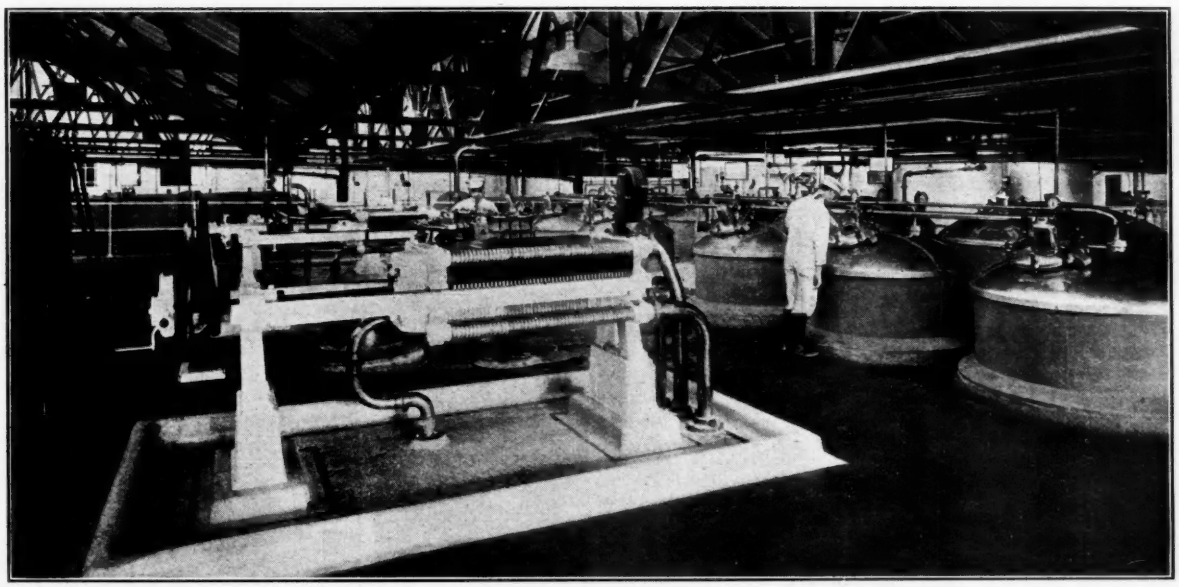
—From " The Independent."

Safeguarding London's Milk

Pasteurising and Bottling at a Modern Dairy Centre

PLANT employed for the pasteurising and bottling of milk incorporates much thoughtful design which, apart from its general interest, is of particular concern to engineers as being a typical instance of handling large quantities of liquid under the most hygienic conditions.

The Express Dairy Company's depot at Cricklewood, which was opened in 1930, is the largest and most modern of its kind in the United Kingdom, and is authoritatively regarded as an outstanding example of large-scale milk handling. The whole of the plant and equipment, moreover, is of British manufacture throughout. It has been laid out solely for pasteurising and bottling milk in accordance with the requirements of the Ministry of Health, as laid down in the Milk (Special Designations) Order, 1923, and has an average output of 400,000 bottles per day or approximately 50,000 gallons of milk. The depot has its own private railway siding, connected to the main line of the L.M.S. Railway which conveys the bulk of the supply, a large proportion being carried in 3,000 gallon glass-lined, stainless steel or aluminium tanks, which link directly with the company's own receiving and cooling stations, strategically situated in the milk producing areas throughout the North and Midlands of rural England. Road tanks of 1,600 to 2,500 gallons capacity are in operation to convey milk from the nearer country receiving stations.



General view of the Pasteurising Plant, showing A.P.V. Heat Exchanger in foreground and tops of the Retarders in background to the right.

The whole of the operations at the depot are controlled day and night by a continuous laboratory service, which is also responsible for testing all incoming milk. The number of samples tested, chemical and bacteriological, averages 6,000 weekly. The company aims at a self-imposed standard count of 10,000 per c.c., with coli absent in 1 c.c.

Considered briefly, on arrival at Cricklewood the fresh milk is removed from rail or road tanks by filtered compressed air and is passed into storage tanks which have a total capacity of 24,000 gallons. From these tanks it is fed to the pasteurising plant, which is of the closed circuit type, with a pasteurising capacity of 4,000 gallons per hour. This plant is hermetically sealed and automatically operated by compressed air and vacuum. The pasteurising process consists of first raising the temperature of the milk to blood-heat in order that it may be effectively cleaned by passage through filters. The filtered milk is then passed through the pasteuriser, where by means of hot water it is finally heated to pasteurising temperature (145° F.). At this temperature it passes into one of a series of six "retarders" or holding tanks where it remains undisturbed for a period of 30 minutes. On leaving the retarders (which are filled and emptied in sequence), the pasteurised milk goes through three stages of cooling. In the first stage it exchanges heat with cold fresh milk on its way to the filters; in the second stage it passes through a water cooler, and in the third stage through a brine cooler, where the temperature is reduced to 40° F. The pasteurised milk, so cooled, then flows into temporary holders which supply the bottle filling and capping machines.

The fresh milk from the receiving tanks is heated regeneratively to cleaning temperature by means of an "A.P.V." heat exchanger, cleaning being done by an "A.P.V." filter. The milk is then further heated in the pasteuriser before running, under the influence of vacuum, into the holding tanks or retarders. There are six of these tanks arranged side by side and the hourly capacity of this room, which is in charge of a single attendant, is 4,000 gallons. As each tank is filled the vacuum is transferred to the next tank which is filled in its turn, whilst the first tank is allowed to stand for the predetermined period of 30 minutes. Thereafter, compressed, washed and filtered air drives the held milk out of the holding tank through the heat exchanger (in reverse direction), where it is cooled prior to filling into bottles.

From these retarders the pasteurised milk now flows, under the influence of compressed air, through the heat exchanger once again, where it is first cooled by the incoming raw milk, then by water and finally by brine, before descending into the finished milk tanks which supply the bottle filling machines.

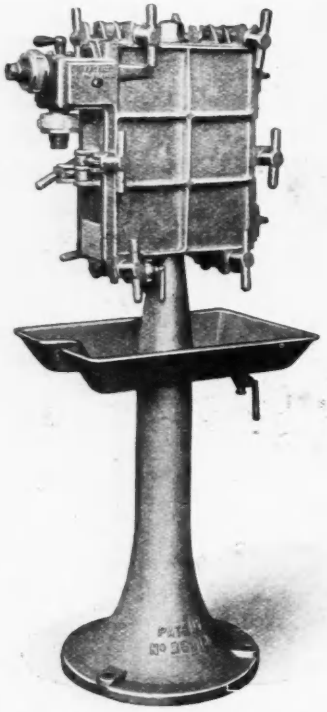
Immediately below the pasteurising room are air and vacuum pumps, as well as the hot water curculating system by which the correct temperature of the milk is secured and maintained.

These "A.P.V." heat exchangers or plate pasteurisers (Aluminium Plant and Vessel Co., Ltd.,) were designed with five main objects. In the first place they provide a machine for pasteurising milk in which all heating or cooling takes place out of contact with air, and without risk of air-borne infection. Secondly, they ensure that every part of all

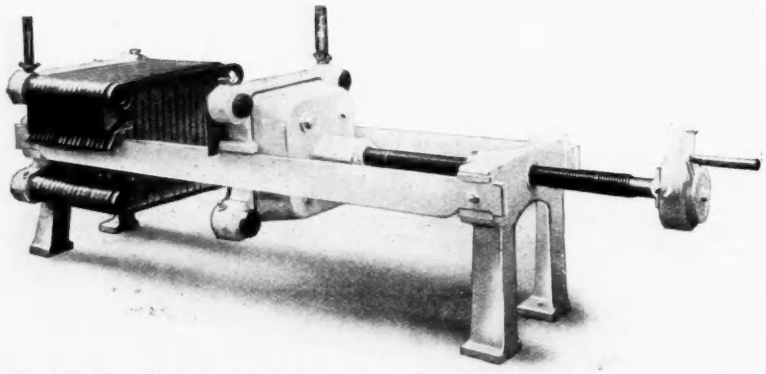
surfaces brought in contact with milk can be easily and thoroughly cleaned, and that the whole machine can be sterilised before each day's run. Thirdly, they provide a method of heating without necessarily bringing milk in contact with steam-heated surfaces. They also carry out both heating and cooling with the maximum of economy and without knocking the milk about and so creating foam. Finally, they provide a machine in which heating and cooling efficiency can be reliably calculated, and remain unaffected by water or brine impurities, or by scale. The remarkable and rapid success of the machine since its introduction in 1924 is evidence that it achieves these objects.

In its simplest form the machine is built up of a number of heavily tinned cast-gunmetal plates, upon both sides of which grooves are produced by machining operations. Flat steel plates placed over these and secured firmly in position convert these grooves into pipes. The standard size of each plate is 19 inches wide, on the working face, clear of projecting passages and handles. The milk to be heated (or cooled) flows up and down across one side of the plate, whilst the heating (or cooling) water up and down the other side of the plate and in the opposite direction. The two liquids thereby exchange heat through the metal plates and, owing to the fact that the grooves are very shallow and very long, the exchange is remarkably rapid. The number of plates used is determined by the required capacity or duty to be performed. The plates are mounted on two side bars, between massive end frames, and by turning a screw the end frames are brought towards one another, and the plates are pressed close together, each plate making a perfect joint against the next by means of special jointing rings. To open the machine for cleaning the process is reversed, and by unwinding this one screw every point touched by the milk is made immediately accessible for cleaning.

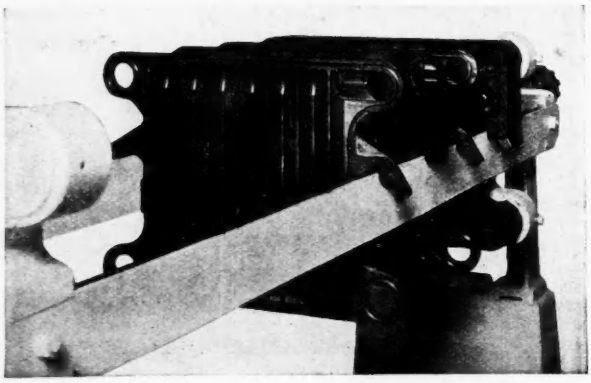
An important feature on the frame of these "A.P.V." heat exchangers is the automatic compensating end. The object of this device is to simplify the operation of sterilising, when the whole machine is brought up to the temperature of boiling water or over. This temperature causes very considerable expansion, and the automatic compensating end takes care of this and of any expansion in the machine in normal working, so that no attention is required on this account, and it is ensured that the machine is thus automatically operated under the correct tension. It will be seen that the moving end of the machine carries a square box inside which are housed four powerful springs. The box is attached to the end plate by four rods, the ends of which project from the box. When the screw is tightened these rods begin to emerge. They are marked with 3 sets of incised rings which appear one after the other as the screw is tightened. The first ring indicates the correct tension for sterilising, the second is known as the "working mark," while the appearance of the third indicates that the machine has been tightened too far and calls for the relaxation of the screw.



The A.P.V. Continuous Filter with two Filters combined in one body.



The A.P.V. Heat Exchanger showing Automatic Compensating End.

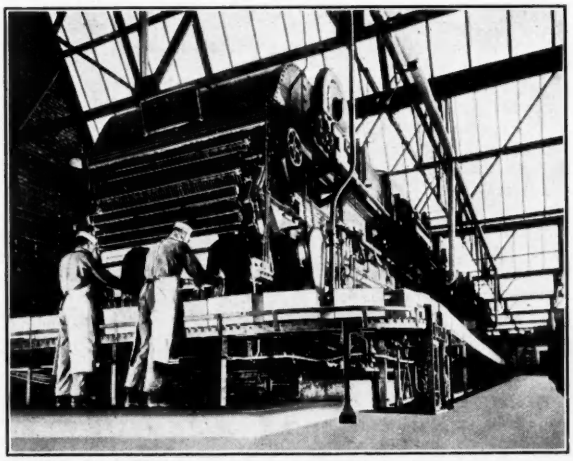


The A.P.V. Heat Exchanger showing Plate Construction and mounting.

The most striking economic advantage realised by the installation of these "A.P.V." heat exchangers is the saving of milk it effects. To pass hot milk over an open cooler entails losses by evaporation which are never less than half of 1 per cent., and are frequently much higher. In the "A.P.V." heat exchanger this loss is entirely eliminated. The direct regeneration which can be carried on also makes it possible to save 50 per cent. and in many cases much more, of the steam used in pasteurising milk. Finally, it must be remembered that every point touched by the milk can be readily examined, can be easily cleaned with an ordinary brush and rendered sterile by hot water or steam.

The main advantage of the "A.P.V." filter over other existing types lies in the fact that it is possible to change the filter cloths without interrupting the process even instantaneously and without breaking any pipe line joints. Filters so far available have often suffered from several serious defects from the dairyman's point of view. The most serious

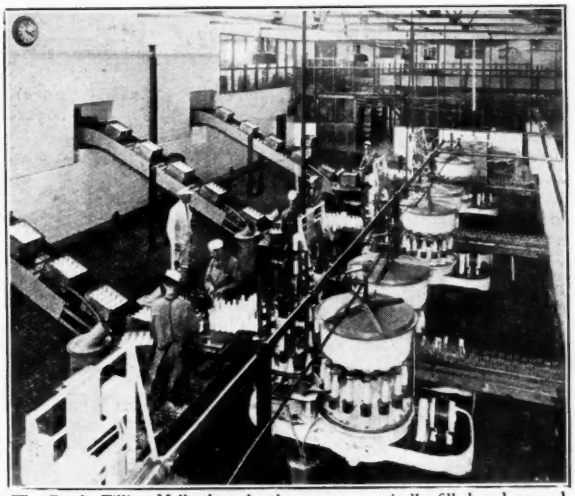
of these has been the choking of the filtering material, which necessitated interruption of the filtering process for some time while a new filter is put in place. To do this it was necessary to "break" one or more connections, a process usually accompanied by loss of milk, and to avoid interrupting the pasteurising process two filters were used. The "A.P.V." continuous filter, however, overcomes these difficulties in the simplest manner. There are actually two distinct filters combined in one body, and each is worked entirely independently of the other, so that one can be opened whilst the other is still in operation. When the filter on the left side becomes choked, the milk is diverted to the right-hand side by turning the single milk cock which is provided to control both inlet and outlet. This cock and the milk inlet and outlet are on the body of the filter, so that it is not necessary to break any connections during the entire run.



One of the Bottle Washing machines in which each bottle receives thirty-five minutes' treatment.

Bottle washing is effected by three hydro-soakers, the largest bottle-washing unit in the world (supplied by G. Hopkins and Sons, Clerkenwell, Ltd.), with a capacity of more than 35,000 bottles per hour. Every individual bottle, however, is under cleansing treatment for 35 minutes. The clean bottles are automatically ejected on to covered mechanical conveyors which carry them immediately to the filling and capping machines. These machines, eleven in number, have a total output of 600 bottles per minute. Filled bottles are transferred by manual labour to crates, and these crates are conveyed mechanically to the lorry loading bank which extends the whole width of the depot, and abuts on one side the cold store where filled crates are temporarily received whilst awaiting despatch.

The bottle filling and capping machines (Graham-Enock Manufacturing Co., Ltd.), are manufactured on the rotary system, so that each bottle can receive individual attention and stand on a separate table, and thus always secure accurate filling and positive capping. The action of the machine is very simple: the empty bottles feed at a steady and uniform rate on to the filling pedestals, these in revolving rise, and in so doing cause the bottle to open the filling valve, and allow the milk to flow into the bottles. After filling, the bottles are transferred to the capping pedestals, and capped continuously and accurately, the caps themselves being fed to the bottles from sterile tubes. All bearings run in an oil bath shut off from drips and splashes which ensures great cleanliness and enables the machine to be automatically lubricated and thus save an hour's daily greasing.



The Bottle Filling Hall where bottles are automatically filled and capped at the rate of six hundred per minute.

(To be continued.)

The Progressive Action of Hydrogen on Coal

A Study of Various Catalysts

INTERESTING points concerning various catalysts were raised in the course of the discussion on the joint paper by Drs. L. Horton, J. G. King and F. A. Williams, "The Progressive Action of Hydrogen on Coal," read before the Institute of Fuel, on November 8, when Mr. S. McEwan was in the chair.

The CHAIRMAN, commenting on the discovery that alkaline oxides had a deleterious action on hydrogenation, said that the ash in coal frequently contained alkaline oxides, and these oxides were likely to be liberated during the process of decomposition and hydrogenation. It had been explained that the ash contained some constituents which acted as catalysts, but they might easily be neutralised by the deleterious action of the oxides referred to.

Dr. ORMANDY said that his connection with hydrogenation dated back to the time when Bergius had installed his first continuous plant for the treatment of coals by the action of hydrogen under pressure. The coals used were all English and he believed that the records were still available to the Fuel Research Board; it would be of very great interest, he suggested, to refer to them again, because a large number of quantitative determinations were carried out on tons of coal from about twenty seams, and it was found that some coals were converted, as was thought at that time, without the action of the catalyst, to the extent of 90 per cent. into oil substances, whereas others were converted only as to 30 or 40 per cent. An obvious explanation might be that some of the seams contained germanium and tin; and, of course, we must take into consideration the fact that Bergius, who claimed that he used no catalyst, used a comparatively large amount (10 per cent.) of Luxmasse, which was proved to contain just the ratio of titanium oxide to iron oxide that would give the optimum catalytic effect, which was very considerable.

In congratulating the Fuel Research Board of the Department of Scientific and Industrial Research upon having tackled a problem of an essential nature, Dr. Ormandy said that a great deal of isolated and sporadic work had been published concerning the influence of hydrogen in the presence of various catalysts on the conversion of coal into oil, but he believed the investigations described in the paper represented the first attempt at a rational and thought-out scheme for a series of experiments constructed with the intention of getting at the fundamental principles underlying the whole chemical reactions which were taking place. After drawing attention to the authors' statement that the catalysts were, in general,

employed as powders, and were merely stirred into the coal, and that in addition other methods of applying the catalyst were tried, he said it was a matter of some interest to appreciate how small was the addition of 0.01 per cent. of a tin salt, to 250 grammes of coal ground to pass through a 200 mesh sieve. Referring to the comparative figures relating to the use of nickel oleate, and nickel oxide, Dr. Ormandy said that the quantities were 0.1 per cent. of nickel oxide and 2½ per cent. of nickel oleate. Incidentally, this raised the question as to what right we had to call anything a catalyst without further definition. Nickel did not react; it was not a catalyst; but nickel combined with oleic acid was a very powerful catalyst. It would have been interesting to have tried nickel formate, because in the fat hardening industry that was the compound of nickel that was most largely used as a specially active catalyst.

Tin as a Catalyst

Dealing further with the use of tin as a catalyst, Dr. Ormandy recalled a statement in the paper that the tin oxide was very readily converted into tin sulphide, and he asked whether experiments had been carried out by using tin sulphide to begin with as the catalyst. There were similes and parallels in the hydrogenation of the heavy oils produced, with the action of tin, from coal. If tin or its salts be added to the thick oils produced by the hydrogenation of coal they had no appreciable or hardly measurable effect in hastening the combination of more hydrogen under pressure with the oils, with the object of converting them into petrol-like substances. On the other hand, molybdenum and tungsten, which appeared to have practically no effect in the conversion of the solid coal into a heavy liquid, were most efficacious in the conversion of the heavy oils into light boiling oils. There was a very appreciable difference in the activity of a molybdenum catalyst, according to whether one started with the catalyst as molybdenum oxide and allowed it to be converted into molybdenum sulphide by the reaction of the sulphuretted hydrogen which was formed at a comparatively low temperature by the action of the sulphur content in the oils dealt with, or whether one started with molybdenum sulphide as a catalyst to begin with.

Dr. R. LESSING said the paper furnished a complete answer to those critics who thought that the Fuel Research Board had outlived its useful life. The work which had been done on this one particular problem was of the very type which really fell within the scope of this Government Department. It furnished results of detailed investigations on matters which neither private individuals nor even small groups of individuals could possibly have the facilities for investigating, but which come within the sphere of those giant organisations which would monopolise the information and would not allow those who might contribute a little to progress in these matters to take part in it. One very interesting matter discovered was the effect of the action of nickel oleate as compared with that of nickel oxide. He felt inclined to agree with the authors that we had to deal with catalysts in the solid phases or at least in the interface between the solid and the liquid vehicle, where a vehicle was being used. Even if 2½ per cent. of the oleate were used, or whatever quantity was used, on the face of it he would expect that the nickel oleate would cover the surface very much more readily than would a solid powder of nickel. With regard to attaining a greater dispersion of catalyst, he suggested that possibly nickel carbonyl might be added, because in its case there would be a gas or vapour, which certainly should spread more readily than even a liquid such as oleate.

Process of Maturification

Mr. JOHN ROBERTS said the aspect of the experimental results dealt with in the paper which interested him, when reading it in conjunction with other publications issued by the Fuel Research Board, was the fact that with the aid of hydrogen it was possible to up-grade an immature coal, or effect a process of maturfication, or coalification, while in the case of a mature coal it could be de-maturified, or de-coalified. Pooley Hall coal was an immature coal of 46 per cent. volatile, and which was non-coking. By treatment with hydrogen under pressure and at a temperature of 380° C., the product could then be converted into a dense coke. This was a process of maturation or maturification, comparable in some degree with the natural process of coalification. In the tests on this coal it was found that as the temperature was increased there was the gradual increase in the proportion of CO_2 in the residual gas, and of the CH_4, and in the yield of water, the latter increasing from 16 units at 340° C. to 28 units at 380° C. It was obvious that the elimination of appreciable amounts of water, CO_2 and CH_4 from the coal was equivalent to up-grading or raising the rank of a coal.

Solubility of Hydrogen

Dr. F. A. WILLIAMS said that although the authors had not stressed in the paper the importance of the solubility of the hydrogen in the vehicle, it had certainly been present in their minds, for they were very much of the opinion that it was one of the most important factors. At the World Petroleum Conference, held in London in July, Dr. Pier had given information on this point, and some figures to show that at 400° C. the solubility of hydrogen in oil was approximately four times as much as at room temperature. He had also made the point that the solubility was greater in liquids of low molecular weights than in liquids of high molecular weights. With regard to the distribution of the catalyst, Dr. Horton had suggested early in these investigations that possibly the reason why very small quantities of catalysts appeared to influence the reaction in the absence of a vehicle was the formation of volatile organic compounds of tin. The authors had looked for such compounds, however, but had not traced any. They had tried quite a large number of substances and had not attained any more success with any of them than with tin tetraethyl. In particular they had prepared very complex load-tin organic compounds, and there they had found no improvement. It was rather interesting that the same result was obtained with 0.01 per cent. catalyst, simply by mixing the catalyst with the coal, as when the catalyst was put on to the coal by wetting (the solution containing the same amount of tin) and the solution evaporated off. That suggested that the distribution of the catalyst merely by mixing it with the coal was adequate, although one obtained an improved result by using a still larger quantity. The authors had considered the use of carbonyls at one time, but had not actually worked on them. Neither had they actually tried nickel formate. Stannous sulphide had been used and was found to be as good as stannous hydroxide. They had also tried dissolving stannous sulphide in yellow ammonium sulphide and precipitating it on the coal, but again there was no improvement; the simple mixture of the stannous sulphide with the coal was sufficient.

Complete De-Ashing of Coal

Mr. W. H. CADMAN suggested that if only we could arrive at a method of de-ashing coal completely, we should settle the point as to the effect of the metallic constituents of the ash and the alkaline nature of the ash. He gathered that the coal used in these experiments had a comparatively small ash content, but even that was sufficient to bring about the difficulties referred to. With regard to the interesting difference between the actions of nickel oxide and nickel oleate, he asked whether the nickel oleate brought about gel formation, so that when a small percentage was added to the mixture of coal and oil it caused the coal particles to remain permanently in suspension in gel formation.

Dr. J. G. KING, dealing with the Chairman's reference to the alkaline oxides in the coal as having a deleterious effect on the reactions, said that this fact had received attention before hand, and it was shown by the experiments of other workers that the reactions proceeded more satisfactorily if they were of an acid rather than an alkaline character, and if the reactions were allowed to become alkaline, the hydrogenation slowed down. Replying to Mr. Roberts, Dr. King said that, in the publication of the Department dealing with the work on the so-called maturification of coal, it was stated that coal could be treated with a small proportion of hydrogen so as apparently to up-grade it, *i.e.*, to make a non-caking coal presumably a caking coal, but it was also stated that that coal had different properties from the coal formed naturally, and the authors had hesitated to say that the reactions which occured were the same as those occuring in nature, although the outside effects of the changes were the same, namely, the elimination of water and hydrocarbons

The Production of Alcohol and Glucose from Wood

By Dr. FRIEDRICH BERGIUS

THE first technical plant for the production of alcohol from wood was established in the United States in 1910 by Ewen and Tomlinson, and used waste shavings from a saw mill in Georgetown, South Carolina, as the raw material, and dilute sulphuric acid as the saccharification medium. Owing to the low yields (6.5 litres of alcohol from 100 kilos of dry wood substance) this plant proved uneconomic, and was only operated for a few years. In Germany the problem of producing alcohol from wood assumed importance during the war. In 1916 a plant to use the process of Alexander Classen was erected in Monheim, near Düsseldorf, and later another plant at Stettin. Here mixtures of dilute hydrochloric acid, sulphuric acid, and sulphurous acid were used as disintegrating media. Although the yields were very little greater than those obtained in the American plant, nevertheless the quantities of alcohol recovered were of importance owing to the abnormal conditions obtaining during that period. An improvement over these methods of producing alcohol from wood with dilute acids was brought about a few years ago by the Scholler-Tornesch method, and, a short time later, by the Epsom process. These processes use dilute sulphuric acid of 0.2 to 0.8 per cent. at temperatures of from 160° to 190° C. under a pressure of about 10 atmospheres. Scholler obtained from 60 to 70 per cent. of the theoretical yield, that is, 20 to 24 litres of alcohol per 100 kilos of dry wood substance by his method. However, since the solutions contain only 2 to 3 per cent. sugar, they can only be used for conversion into alcohol or other products of fermentation. The economical production of a solid or highly concentrated carbohydrate is not possible in this way as the quantity of liquid to be evaporated is too great.

At a meeting of the Institution of Chemical Engineers, held in London, on November 15, Dr. Friedrich Bergius described the steps by which the utilisation of wood, for the production of foodstuffs, alcohol and glucose, has been developed on a commercial scale at Mannheim-Rheinau. The president, Viscount Leverhulme, was in the Chair.

Decomposition of Cellulose

These processes bring about the transformation of cellulose into sugar by a dilute acid at relatively high temperatures. At the temperature necessary for the reaction, the glucose formed from the cellulose is not stable and is easily decomposed. The percentage of decomposed cellulose was very high in the processes of Ewen and Tomlinson and Classen. It was brought down considerably in the Scholler and Epsom processes. This increase in the percentage of sugar produced from the wood, however, could only be obtained by decreasing the sugar content of the final solutions. These processes make use of the fact that the decomposition of sugar is smaller in a weak than in a highly concentrated solution. Obviously the decomposition of sugar cannot be avoided, and 30 to 40 per cent. of the wood sugar is lost during the operation. This loss can be avoided if the hydrolysis of the cellulose is conducted at temperatures at which glucose is stable in the presence of acid.

In 1910, Willstätter and Zechmeister published the well-known paper in which they stated that, at normal temperatures, hydrochloric acid containing at least 40 per cent. of HCl easily dissolves cellulose with the formation of a glucose solution.

In 1916 the conditions in Germany, brought about by the war, made it impossible to import foodstuffs, and it became evident that the home production of foodstuffs, especially carbohydrates, was of fundamental importance for the life of the nation. Willstätter and Zechmeister's method of reaction by means of concentrated hydrochloric acid seemed the best possible basis for a technical process. The velocity of the reaction between hydrochloric acid and cellulose is sufficiently great at normal temperatures when hydrochloric acid is brought into contact with dry wood. The solution containing ⅓ of the dry wood substance may easily be separated from the remaining part of the wood, the lignin. The most difficult problem was the separation of the relatively large quantity of hydrochloric acid from the sugar solution, so that, first of all, we had to devise a reasonable method for recovering the hydrochloric acid by vacuum distillation. In 1916 we began to build up the wood hydrolysis process, sometimes called the "Bergius wood-sugar process," under the auspices of Th. Goldschmidt A.G., Essen. The reaction between wood and hydrochloric acid of 40 per cent. strength requires a comparatively large surplus of acid. To produce the largest possible quantity of sugar from the wood, 7 parts of hydrochloric acid have to be added to 1 part of wood. In this way a solution is obtained containing less than 10 per cent. of sugar. The recovery of the hydrochloric acid from a solution containing only 10 per cent. of sugar would be a difficult and expensive procedure. It was found, however, that a sugar-containing solution is able to react with fresh wood, thereby increasing its concentration of sugar.

Making use of this fact, we succeeded in increasing the sugar concentration by conducting the process in a battery of from 8 to 10 vessels. The fresh wood filled into vessel No. 1 is brought into contact with an acid containing a comparatively high concentration of sugar coming from vessel No. 2. Vessel 2 contains wood which has already lost part of its cellulose content and is now brought into contact with the solution coming from vessel 3 and so on. The last vessel of the battery is filled with the highly concentrated acid which dissolves the last traces of the cellulose material and leaves a lignin free from both cellulose and sugar. With this method we were able to increase the sugar concentration up to 40 per cent., which is obviously of enormous advantage in the recovery of the hydrochloric acid in the next stage of the process. The last vessel filled with lignin and hydrochloric acid free from sugar is now washed out systematically with the minimum amount of water. The acid from the washing treatment is then conveyed to a plant where hydrochloric acid gas is added to increase the HCl concentration to 40 per cent., so that the acid can be used again for a new operation.

An Interesting By-Product

This battery of vessels is the only part of the wood sugar plant where a chemical reaction takes place. But this reaction is not as simple as it would seem at first sight. It is not only the cellulose of the wood which is attacked and hydrolysed by the acid, but the hemi-cellulose, hexoses and pentoses are likewise easily dissolved. Acetic acid is found in the sugar solution in about the same quantity as is obtained by the wood distillation process. It constitutes an interesting by-product of the process.

The reaction between dry wood and hydrochloric acid is exothermic. The heat produced during the operation is derived from two sources; dry wood develops heat when it comes into contact with water, and the hydrolysing reaction also produces a certain quantity of heat. If, in carrying out the process on a large scale, means were not provided to prevent increase of temperature, great loss of sugar would occur which would render a technical procedure impossible. The relatively large quantity of liquid acting on the wood is a very good medium for avoiding superheating if from the beginning of the reaction measures be taken to ensure that every part of the fresh wood comes in direct contact with the liquid. For this purpose, the fresh wood, before entering the reaction vessel, is mixed with the liquid on a special conveyor.

The final product from the batteries consists of a solution of sugar in concentrated hydrochloric acid, and means had

to be devised to separate the sugar from the acid, employing relatively low temperatures, that is 40° and 50° C., to avoid decomposition of the sugar, and to maintain the acid in the concentrated form. It is important that the resulting sugar should contain only minimum quantities of acid, as any residual acid would impair the usefulness of the product. The method finally devised depended on vacuum distillation, and it is an advantage of this method that the hydrochloric acid is volatile at relatively low temperatures. Such a method presents no difficulty in a laboratory apparatus made of glass, but it becomes complicated when conducting it on a large scale. The stoneware available at the time had a very low heat conductivity, so it was not possible to build distilling apparatus with stoneware tubes. Therefore, a special method had to be worked out which avoided the difficulty of transferring the heat necessary for evaporation through the walls of the vessel. To-day, however, stoneware tubes are produced with a much higher heat conductivity, and special vacuum stills, which are working very well, have been constructed of this material.

Treatment of the Syrup

The concentrated syrup still contains 8 to 9 per cent. of the acid, which means 40 to 50 per cent. calculated on the sugar. It is impossible to remove the remaining acid by a normal concentrating or drying method. Only by treating this syrup with hot air in a special atomising-dryer in which it is finely atomised by air pressure and dried in a stream of hot air can the hydrochloric acid content be brought down to 1 to 2 per cent.

The product leaving the drying apparatus contains about 90 per cent. of sugars of different kinds, and about 2 per cent. of hydrochloric acid, as well as small percentages of other organic and inorganic substances and water. This product, a raw wood sugar, is the final product of the primary process. The distillate from the vacuum still contains the acetic acid formed during the process. A special method was worked out to recover this acetic acid, the output of which is 3 to 5 per cent. or somewhat higher. According to experience the total loss is not more than 10 per cent. HCl calculated on the sugar produced. Practically no loss of sugar occurs during the reaction, as every possibility of decomposition due to increase of temperature is excluded. So when the process is conducted in the right way, the yield in products reaches well-nigh the theoretical output of sugar from wood, that is 66 per cent. of the dry wood.

Building up the Chemical Basis

Some years were necessary to build up the chemical basis of the process and to work out a semi-technical plant in which to test the results of the laboratory experiments. These latter experiments were carried out on an apparatus which was a real model of a big plant with a battery of ten vessels, each of a 100 litres capacity. The results of this model plant at Mannheim-Rheinau, constructed and operated between 1920 and 1924, were able to be reproduced between 1925 and 1928 in the first technical plant at Geneva, where the size of the diffusers was increased from 100 to 4,000 litres. At the Geneva works we first worked on the Prodor process based on the patents of Levy and Terrisse. This process used hydrochloric acid gas in a complicated apparatus for the saccharification of wood, but it proved unsuccessful on the technical scale.

After the failure of the Prodor process we began in 1925 to build up our own process. Continuous-running demonstrated the fact that the plant was absolutely hydrochloric acid-tight, and this is one of of the main requirements for carrying out the saccharification process on the technical scale, as it demonstrated the flawless operation of the complicated system of piping. Frequent tests made by the local authorities showed that no public annoyance was caused by the hydrochloric acid in the operation of the apparatus, and that there was no trace of hydrochloric acid in the air surrounding the factory. The output of the plant corresponded to the size of the equipment.

In 1928 the technical staff was therefore taken back to Mannheim-Rheinau to take up the work preparatory to the building of a plant on an industrial scale. Mannheim-Rheinau was selected as a site for the first large factory, because it is situated on a waterway, thus facilitating the transport of the raw materials and of the products. Further, the factory, which was formerly used for our coal hydrogenation process, could be adapted to the new purpose of wood saccharification. The actual construction began in the autumn of 1932, and by May, 1933, the factory was completed and has now been in continuous operation for some months. Already, it has been shown that the same yield of carbohydrates from wood can be obtained, as in the Geneva plant. The large Rheinau plant has a diffusion battery capable of a yearly production of from 6,000 to 8,000 tons of pure carbohydrates. The size of the diffusers is five times that of each diffuser of the Geneva plant, that is, 20 cu.m., or about 700 cu. ft., but whereas the Geneva diffusers were built of acid-resisting Prodorite, the Rheinau diffusers are of iron, lined with small acid-resisting tiles joined together by a special cement.

The Mannheim-Rheinau Plant

The wood, which normally contains from 20 to 40 per cent. moisture, is first cut in special shredders and mills, and is then dried in a revolving drier until it contains about 1 per cent. of moisture. The heat for drying the wood can easily be furnished by the waste heat of the boilers. Before being introduced into the diffusers, the dry wood is moistened with a solution coming from the last diffuser containing sugar and hydrochloric acid, and is then transported to the diffuser No. 1 and dropped in through the top opening. After allowing a short time for the reaction to take place in this newly filled diffuser No. 1, fresh highly concentrated hydrochloric acid is pumped into the last diffuser No. 8. The liquid contained in this diffuser is then transported to diffuser No. 7, the solution from No. 7 to No. 6, and so on. The solution at the top of diffuser No. 1, containing normally about 35 per cent. of sugar, is drawn off to the distillation plant, and a new filling operation may then be started. Vessel No. 8 is washed out systematically, giving a solution with from 37 to 38 per cent. of hydrochloric acid, which is then led to the regeneration plant.

The recuperation of the 40 per cent. hydrochloric acid is performed by the absorption of HCl gas by the acid from the washing process, and takes place in a plant especially constructed for the purpose. Special means of cooling are necessary to remove the heat generated in recuperating the acid and to keep the acid plant within reasonable dimensions. There is no perceptible smell of acid during the normal running of the plant when producing 40 per cent. hydrochloric acid. In the evaporation station the hydrochloric acid is distilled under a vacuum of about 30 mm. of mercury at temperatures of from 40° to 45° C. The iron parts of the evaporator which come in contact with the hydrochloric acid are covered with rubber of a special make. Condensation of the acid vapours is effected in stoneware coils which, however, will shortly be replaced by another type of condenser built of protected iron.

At the same time, the acetic acid originating from the wood and contained in the battery solution is distilled and condensed together with the hydrochloric acid. When the concentration of the acetic acid in the condensate reaches 10 per cent., part of the condensate must be removed and the hydrochloric acid separated from the acetic acid.

Recovery of Acid

The syrup from the distilling apparatus, containing about 55 to 65 per cent. of sugar, is dried by hot air. The syrup is injected together with compressed air through a nozzle. The hot air is blown into the shaft of the evaporator, whence the solid sugar, in finely divided form, enters a cyclone in which separation takes place: the dry sugar drops into the bottom of the cyclone separator, and is drawn off whilst the air containing water and hydrochloric acid gas leaving the plant is washed. The rest of the hydrochloric acid is recovered in an ordinary absorption plant. The more or less diluted condensates and solutions of the hydrochloric acid are used in the same way as the distillate of the evaporation process, with the result that a very large percentage of the acid is recovered. Hydrochloric acid is lost only by retention of small quantities in the lignin and sugar. The lignin must

be washed as free as possible from acid, so the loss is only about 5 per cent. of hydrochloric acid, calculated on the sugar produced, and the sugar contains about 2 per cent.

The process is now a very simple one. Neither reaction vessels, pumps, conduits or buildings are attacked by the acid, nor are the workmen annoyed by acid vapours. It took a vast amount of experimental work to find the right form of the apparatus and the proper constructional materials.

The lignin can be used directly for heating purposes in the process, and can be briquetted without the addition of a binder. Such briquettes have a calorific value of 5,000 calories, or approximately 9,000 B.Th.U. per lb. and form a clean and convenient household fuel. From these briquettes a pure and hard charcoal can be obtained.

Inversion of Sugars

The sugar, in the form in which it leaves the hot-air drier, contains about 2 per cent. of hydrochloric acid, a small percentage of inorganic compounds from the wood and some moisture. The content of reducing sugars is about 90 per cent. Only a small part of the sugars is present in the monomeric form, the largest part being polymeric. During the passage of the sugar from the battery to the atomiser, the percentage of tetrameric sugars is increased. This polymeric sugar can easily be transformed into monomeric sugar by inverting it in a 20 per cent. solution a little above the boiling point. The sugar from conifers contains, besides glucose, especially mannose and pentoses; the sugar from foliaceous trees, chiefly pentoses in addition to glucose. Mannose and pentoses are the products of hydrolysis of the hemicellulose which can easily be extracted at relatively low temperatures from the wood by dilute acids. We have worked out a special process for this purpose. The hemi-celluloses are saccharified and extracted by treating the wood, before it is brought into the drier, with very dilute acid. The pre-extracted wood is then dried and brought into the battery. This process allows the recovery of pure xylose free from glucose in crystallised form.

The raw sugar in its primary form can, after neutralising, be used as a carbohydrate cattle food. It must undergo inversion before it can be fermented, but this inversion is a very simple and inexpensive process. To produce alcohol, only the hexoses can be fermented, so that 100 kilos of reducing sugar yield about 52 litres of 100 per cent. alcohol; normal cane sugar yields about 60 litres. Other fermentation products, as for instance lactic acid, can also easily be produced from this product.

During recent years we have found a method for crystallising pure glucose from the inverted solution of the raw sugar. This seemed a very difficult task in the beginning, and it took us a number of years to develop the crystallisation process to its present simple form. The crystallised glucose can be obtained either in an anhydrous form or containing water of crystallisation. The product is chemically pure.

Points from the Discussion

Dr. W. R. ORMANDY said that the Prodor process was exceedingly clever in its general conception, but it had proved impracticable to carry out on a commercial scale. The great achievement of Dr. Bergius in his process was the change-over from diffusion vessels of 100 litres capacity to 4,000 litres capacity, in which there was considerable heat evolution in a mass of non-conducting material. That was a problem of considerable difficulty and it was the discovery by Dr. Bergius of wetting the wood first of all with hydrochloric acid which had a certain amount of sugar in it, which rendered the process possible, otherwise the heat evolution led to actually charring the wood. Although the problem was more or less in its essentials solved in the Geneva plant, it still had to be worked out in considerable detail at Rheinau in regard to the heat evolution and the relationship of the sugar to the hydrochloric acid in the sugar. It had been rather surprising to hear that Dr. Bergius had discovered a rubber for use in the process which would withstand 40 per cent. hydrochloric acid, because his own experience with rubber and semi-ebonites with hydrochloric acid especially of 40 per cent. strength had been particularly unfortunate. In the same way he would like to know the nature of the cement used with the tiles which formed part of the apparatus working with a 40 per cent. hydrochloric acid solution.

Mr. NORMAN SWINDIN also asked for further information with regard to the nature of the rubber and the cement used in the apparatus. Was the rubber uncured?

Mr. J. ARTHUR REAVELL called attention to the reference by Dr. Bergius to the use of bakelite which surprised him somewhat, as hitherto he had not been aware that bakelite had any good properties when used with hydrochloric acid. Some of the phenol formaldehyde resins, in conjunction with other products, however, he believed could be used for this purpose. He said his own company had been developing material of the phenol formaldehyde resin type for dealing with hydrochloric acid and this could quite successfully handle commercial hydrochloric acid up to boiling point, with practically any size of pipe. Continuing, Mr. Reavell said he was not sure whether he understood Dr. Bergius to say that in connection with drying the sugar in a spray drier there were traces of hydrochloric acid vapour coming away in the hot air with the sugar. Could Dr. Bergius say what the spray drier chamber was made of.

Dr. BERGIUS, replying first to Mr. Reavell's question concerning the spray drier, said that this apparatus had been in operation for six years and as the hydrochloric acid was always in the form of an unsaturated vapour and could never condense, it was a simple matter to protect the iron with a special cement that was acid-proof. The bakelite referred to was, of course, not the ordinary bakelite, but a special type which had been found to resist hydrochloric acid quite satisfactorily. The cement used was also a similar kind of special bakelite which had been found to resist 40 per cent. hydrochloric acid. With regard to rubber, this question had been studied from many points of view and in many different works, and it was not only a question of the quality of the rubber, but also the method which the rubber was fixed on to the surface of the iron.

United Molasses Co., Ltd.

Re-Organisation of Capital

IN view of the cessation of losses on forward contracts and the improved position of the company's business generally, the directors of the United Molasses Co., Ltd., state that the time has now arrived when the reorganisation of the company's capital should be undertaken.

According to the report for the nine months to September 30, 1933, realised losses at the end of September last which must be provided for and written off, amounted to £2,560,476. In addition, the directors are of opinion that a further £670,000 is required to write down the book value of assets which are still held.

It will therefore be seen, continues the report, that there is some £3,230,000 which should be written off the share capital of the company, if the balance-sheet is to be cleared and the company placed in a position to resume payment of dividends when trading profits are available. The directors recommend that this sum should be provided by writing 13s. 4d. per share off the 4,851,251 ordinary shares of £1 each, thus reducing each paid up ordinary share from £1 to 6s. 8d.

Owing to the reduced demand in America and the lower production of molasses in Java, it may be advisable to realise some of the assets no longer required for the purpose of the business, and it is proposed to apply the proceeds of such realisations in repayment of part of the capital paid up on the preference shares. To enable this to be done legally, it is proposed that each preference share of £1 should be divided into 10s. of 6 per cent. cumulative unsecured income debenture stock (redeemable at the company's option at 110 per cent.) and 10s. of 6 per cent. cumulative preference stock which will be irredeemable.

Arrears of dividend on the preference shares from December 15, 1930, to September 30, 1933, amounting to £314,062, will, under the proposals submitted, be cancelled. To compensate the preference shareholders, it is proposed to issue to them a corresponding amount of 4 per cent. cumulative funded income stock. The directors have received an offer to purchase at 95 per cent. any of the funded income stock which preference shareholders desire to sell.

Is Insulin a Fine Chemical?

An Inquiry under the Safeguarding of Industries Act

AN inquiry into a complaint that insulin and its salts have been improperly excluded from the list of articles chargeable with duty under Part I of the Safeguarding of Industries Act, 1921, was held at the offices of the Board of Trade, at Westminster, on November 17 and 18. The tribunal consisted of the Hon. S. O. Henn Collins, K.C. (referee), Professor F. G. Donnan, F.R.S., and Professor Samuel Smiles, F.R.S. The complainants were the Association of British Chemical Manufacturers, on behalf of British Drug Houses, Ltd., Boot's Pure Drug Co., Allen and Hanbury and Burroughs Wellcome and Co. They claimed that insulin should be included in the list on the ground that it was a fine chemical. There was opposition by C. L. Bencard and Co., the London representatives and sole agents for a Danish firm making insulin. The Board of Trade was also represented.

Mr. TREVOR WATSON, K.C. (for the complainants), said the two questions before the tribunal was whether insulin was a chemical, and whether it was a fine chemical. The amount of insulin imported was only about 1 per cent. of the total on the market in this country; and if it were proved that it did come within the taxation standard under the Act there was no intention on the part of the complainants to use that fact to raise the price of the British article. The Board of Trade, in preparing lists of articles chargeable with the duty under the Act, was concerned only with substances in commercial use. Many times a body, which might have been only a chemical curiosity at the time of the passing of the Act, had subsequently assumed such importance that the question of its inclusion in the list had had to be considered. It was partly for that reason that the complainants were asking, twelve years after the passing of the Act, whether insulin had really been taxable all the time.

Mr. MORITZ said that even if insulin were found to be a chemical, he would not admit that it was a fine chemical.

Chemical Characteristics

Mr. WATSON, having described the method of preparation of insulin, said the factors showing that crystalline insulin was a definite chemical product were many. (1) Different specimens of insulin exhibited the same iso-electric point. (2) Insulin could undergo methylation; the iso-electric point of different specimens of the methylated product was again the same, and by taking away the methyl radical which had been added one obtained reactivated insulin. (3) Determinations of percentage composition of specimens from different sources of supply agreed within the limits of experimental error; there was about 53.3 per cent. of carbon, about 6.7 per cent. of hydrogen, about 15 per cent. of nitrogen and about 3 per cent. of sulphur. The nitrogen content was regarded by the chemist as of very considerable importance in the identification of a protein (and insulin was a protein), and the high content of sulphur identified insulin to a very large extent among the proteins to which it was related. (4) Insulin had the property of specific rotation of the plane of polarisation. (5) The absorption spectrum, which indicated the presence of certain amino acids, which were always present. (6) Crystalline insulin had a characteristic crystalline form, as shown by the work of Clark and Corrigan in the Chemistry Department of the University of Illinois. (7) The decomposition point of crystalline insulin under heat was 233° C. (8) The solubilities of salts of insulin hydrochlorides, sulphates and picrates in solutions such as alcohol, ether, acetone and acetic acid had been determined and found to be constants over different specimens. (9) The constant reaction to precipitants such as picric acid, trichloracetic acid, sodium oxalate, sodium chloride and ammonium sulphate; that set of reactions, in the view of experts, classified insulin definitely as a protein. (10) The production of the hydrolysis of certain acids which could be readily identified by accepted methods. (11) Precipitation by heat in the presence of acids.

Even though it was perhaps easier to recognise insulin by biological and physiological tests than by purely chemical tests, there were many substances already in the list of dutiable articles which for their standardisation required biological as well as chemical tests and sometimes biological tests only, so that the problem of recognition by biological test was not a critical one in this inquiry. It was the contention that insulin belonged to the protein family, a family of bodies with a highly complex molecule, and although the chemical constitution of many of them had not been definitely ascertained, with the growth of knowledge more and more of the protein family were recognised as chemicals in the true sense. One of them, of particular importance, was refined haemoglobin.

In deciding whether a chemical was a fine chemical, one of the tests to be applied was whether or not it was made by fine chemical manufacturers; this test had been applied at previous inquiries. One of the present complainant firms produced both pharmaceutical products and fine chemicals, and, long before any controversy in this matter arose, it had manufactured insulin in its fine chemical factory and not in the pharmaceutical products factory. Another factor was that in the preparation of insulin there were certain phases which required the exercise of very considerable skill. The heating had to be applied up to a certain point, and the determination of hydrogen ion concentration had to be done at a certain point. A statement prepared by the Board of Trade, however, contended that the insulin of commerce was not a fine chemical and not a single chemical entity.

Evidence of the Experts

Professor R. ROBINSON, D.Sc., F.I.C., F.R.S. (professor of chemistry, Oxford University), giving evidence for the complainants, said he had no personal experimental knowledge of insulin, but he possessed knowledge derived from the literature and from discussions with others more intimately concerned with it experimentally. He quoted figures obtained by different workers to show that the percentages of carbon, hydrogen and nitrogen were remarkably coincident; the analysis of insulin was quite as satisfactory as the analysis of any other protein from the point of view of constancy of results, and it was perhaps the best investigated of the known proteins. Referring to the work of Harrington and Scott, Professor Robinson described a paper by them, published in 1929, as classical; he said he had seen the crystals Dr. Harrington had isolated and was amazed by their regularity; he was impressed at once by the fact that here was a definite chemical substance. The word "chemical" had a varying significance in common usage. He would define a chemical in popular usage as being a material or matter or substance which possessed some characteristic property or use. He regarded insulin as a fine chemical because it had a particular property which no other substance so stable possessed, and because it was produced in relatively small amounts by manufacturers who devoted their attention to the preparation of substances which he would also call fine chemicals.

Professor J. C. DRUMMOND, D.Sc., F.I.C. (professor of bio-chemistry, University of London), in evidence, said he regarded insulin as a chemical entity, and the Canadian method of preparation as a chemical method.

Dr. F. H. CARR, F.I.C. (a director of British Drug Houses, Ltd.), who also gave evidence for the complainants, referred first to the production of sulphate of quinine of vegetable origin, which was mentioned specifically in the schedule to the Act as a fine chemical to be exempted from the safeguarding duty. He gave details of the process of its manufacture, and said it was a process very similar to the preparation of insulin in regard to its alkalisation and acidification, and in passing from the salt to the base. The method described by Scott and Parker was not merely a laboratory method, but was the manufacturing method employed in the Connaught Laboratories in Canada. He had visited those laboratories, had seen the method in operation, and had discussed it with Dr. Scott; the whole of the insulin for the Dominion of Canada was manufactured by that process in

that laboratory. The process used by himself in this country was even more elaborate, for there were several more stages than in the Canadian process. He estimated that British Drug Houses, Ltd., and Burroughs Wellcome manufactured well over 80 per cent., and probably 90 per cent., of the insulin consumed in this country. The process had to be watched hour by hour, and it involved skilled supervision at various stages.

The Case for the Opponents

Mr. MORITZ, presenting the case for the opponents, urged that the word "chemical" was not used among scientific men as a substantive noun, and that the words "substances," "reagents," and "bodies" more or less exhausted their nomenclature in referring to chemical bodies. The real people to whom the Act was addressed were the men who dealt with these things commercially. Such persons would define a chemical as something of a definite and ascertained constitution which could be definitely identified, and produced by ordinary chemical methods, to be used in chemical operations. He emphasised that the complainants in this case had not produced any of that class of person as witnesses; they had called scientific men who said that they did not use the phrase "chemical," and that to their minds it did not possess any scientific meaning. Professor Robinson had set up a criterion which, Mr. Moritz submitted, was wholly impossible. It was that a body was or was not a chemical according to whether it possessed some special and striking quality. To suggest that Parliament had meant to include all chemical substances within the word "chemical" as used in the Act would mean that everything in the chemical world must be searched in order to find out which of its constituents could be called "fine." The intention was to include those things which could reasonably be called chemical by commercial men dealing in these things, and then to decide which of those could reasonably be called "fine."

Dr. E. F. ARMSTRONG, F.R.S., late managing director of the British Dyestuffs Corporation, and past-president of the Society of Chemical Industry, gave evidence for the opponents. He said he had carried out considerable research on enzymes and proteins. He did not regard commercial insulin or the crystalline insulin as an unique chemical body. No single one or any combination of the points put forward by the complainants with a view to showing that insulin was a definite chemical product led him to believe that the commercial insulin was a single chemical body.

Bodies made by Chemical Methods

Mr. MORITZ, in his address on behalf of the opponents, said that what the Act intended to include as fine chemicals were bodies made by chemical methods, to be used for chemical purposes—in which he included medicinal purposes, because they were chemical purposes—produced by methods of accuracy; also, the bodies must be known—each must be one body or must be a perfectly ascertained mixture of known bodies, whose proportions in the mixture were known. The only safe thing for the tribunal to do was to say that they would not include anything in the list until they knew what it was—although he did not suggest that the structural formula must be agreed upon by the general body of scientific opinion or that the substance must be dead pure in the B.P. sense. Bodies must graduate for inclusion in the list, and he contended that insulin had not yet graduated.

Mr. L. F. HEALD, addressing the tribunal on behalf of the Board of Trade, submitted that the Board must be absolutely satisfied that an article was a fine chemical before it could include it in the list as a fine chemical.

Mr. TREVOR WATSON, K.C., for the complainants, said that the criteria as to the method of production and isolation of insulin, and the purpose for which it was employed, were concluded in his favour. He had also proved his case in regard to the methods of recognition, because although insulin had to be subjected to a physiological test, Dr. Armstrong had agreed that if it were subjected to a series of physical and chemical tests, he would be practically certain that the body was insulin.

This concluded the inquiry and the tribunal will give its decision in due course.

Dermatitis from Dyed Trimming

High Court Judgment

IN the King's Bench Division on Tuesday, Mr. Justice Goddard had again before him the action by Mrs. Barbara Wills, of Old Cottage, Esher, against Bentalls, Ltd., of Kingston-on-Thames, in which he awarded the plaintiff £172 11s. damages, with costs, in respect of illness from dermatitis which she alleged she contracted through wearing around her neck on a coat some trimming which she purchased from the defendants.

Defendants denied that there was anything deleterious in the trimming. They claimed to be indemnified by the third party, Debenhams, Ltd., the wholesalers, from whom they purchased the trimming in bulk; Debenhams, Ltd., claimed an indemnity from Astrachan, Ltd., the manufacturers of the Trimming, Astrachan, Ltd., from Smithson-Gledhill, Ltd., the dyers of the material, and Smithson-Gledhill, Ltd., from Imperial Chemical Industries, Ltd., the manufacturers of the dye.

Imperial Chemical Industries, Ltd., through their chief medical officer, Dr. T. E. A. Stowell, agreed with the diagnosis of dermatitis, but not of dye dermatitis.

The case now came up with regard to the judgment to be entered against the remaining parties, and on the question as to costs.

All the defendants were represented by council and there were long legal arguments as to costs.

His lordship thought the first defendants ought to have judgment for the amount of damages they would have to pay with the costs they would have to pay and their own costs, against the third party.

His lordship could not understand why some arrangement was not made between the parties to fight the case. He did not think there had been the team work there might have been in the case.

Sir Patrick Hastings, K.C. for the fifth parties took the view that the matter should be ended and that there should be a settlement. He understood the I.C.I. took the view that there was some matter of importance to be decided. His clents did not want to fight anybody. They wished to settle the case.

Mr. Willes, for I.C.I., said the difficulty the I.C.I. were in was that they were not going to be made liable for dye dermatitis or bad dye, without an opportunity of determining in what respect the dyers work was bad.

His lordship said all the Court held was that this was an unfortunate accident, but no one suggested that the I.C.I. sent out bad dyes.

Mr. Willes submitted that the result was not due to defective dyes, and that they were not responsible for the use of the dyes by the dyers.

Ultimately his lordship said he was obliged to hold that Sir Patrick's clients were bound to indemnify the fourth parties, with the same order as to costs.

If this dispute between the fifth parties and I.C.I. (continued his lordship) was going to be turned by the I.C.I. into a State trial, the case had better go into the special jury list for trial. All he could say was that the I.C.I. sold perfectly good dyes and that the dyers were good dyers.

His lordship then directed that the issue between the fifth and sixth parties should be tried and that there should be a statement of claim and defence.

Judgment was entered for the plaintiff with costs against the defendants, and defendants would have judgment against the third parties, with certain costs, and the third parties would have judgment against the fourth parties with certain costs, and the fourth parties would have judgment against the fifth parties with costs.

Argentina Imports More Turpentine

PRELIMINARY statistics covering imports, recently released, show that total imports of turpentine into Argentina for the first half of 1933 reached 803,290 lb. in comparison with 622,182 lb. imported for the 1932 period. Rosin imports dropped to 14,747 lb. from 23,594,230 lb. for the corresponding period of 1932.

Letters to the Editor

The Editor welcomes expressions of opinion and fact from responsible persons for publication in these columns. Signed letters are, of course, preferred, but where a desire for anonymity is indicated this will invariably be respected. From time to time letters containing useful ideas and suggestions have been received, signed with a nom-de-plume and giving no information as to their origin. Correspondence cannot be published in THE CHEMICAL AGE unless its authorship is revealed to the Editor.

Trade Mark Registration in South Africa

SIR,—The attention of readers interested in the South African market is drawn to an important circular letter issued by our South African associates with regard to the importation into South Africa of goods contravening the trade marks and merchandise marks laws. The circular states that the Commissioner of Customs has notified his officials in the Union that in view of the continued importation of goods marked with or bearing (a) false trade descriptions; (b) trade marks illegally used; (c) colourable imitations of registered trade marks; and (d) the word "registered" in respect of a mark which upon inquiry is found not to be registered in the Union, it has been decided to discontinue the practice hitherto followed of allowing delivery of the goods on the removal or obliteration of the offending marks. Any goods imported into the Union on or after November 1, 1933, which are found in any way to contravene existing Union law relating to trade marks or merchandise marks, and therefore prohibited from importation, will be *seized as forfeited;* provided however that in the case of goods offending as in (d) above described, or in any particular case when the circumstances are such as to merit special consideration, the Department will be prepared to consider applications to be allowed to reship the goods to the suppliers, on condition that a written undertaking is given not to make any claim in respect of the goods and provided they have not left Customs custody. Any duty paid will not be refunded, for duty is leviable on all goods imported whether imported legally or illegally.

The Trade Marks and Merchandise Marks Acts can be treated as identical with the corresponding British Acts. "Registered" on a mark means, in the Union of South Africa (see Section 185 of the Trade Marks Act), and the fact that the mark is registered outside the Union of South Africa, is immaterial. "Registered" placed under a mark means that the whole mark, as displayed, is registered. Placing "registered" on a trade mark which is not registered in the Union of South Africa is a criminal offence, under the same section, for which local retailers can be prosecuted."

Traders are advised to (1) examine all their labels in use in South Africa to see that none of them infringe the above mentioned laws; and (2) register their marks in the Union of South Africa forthwith to avoid the above and other difficulties, and to protect their common law rights. South African trade mark registrations last 14 years and are renewable.—Yours faithfully,

Staple House,
51-52 Chancery Lane, W.C.2.

GEE AND CO.,
Patent Agents.

University Trained Men as Salesmen

SIR,— In your comments on the "University called the World," in THE CHEMICAL AGE of October 7, you refer to a statement made by a coal owner, that university trained men think it beneath them to accept employment as salesmen. That may be so in the south, but we in the north of Scotland realise that our university training is only one of the gates that gives entry to this "University of the World." It would therefore not be difficult for the coal-owner to get from amongst us a man who would be willing to serve with him as salesman. I am a product of a Scottish University, graduating B.Sc. in July, 1933, with chemistry and geology as principal subjects, thereby possessing a competent knowledge of coal, both in its mining and in its chemistry. I, for one, would gladly take any opportunity offered to qualify for salesmanship.—Yours faithfully,

JOSEPH RITCHIE, B.Sc. (Aberdeen).

26 Mid Street,
Rosehearty, Aberdeenshire.

Chemical Matters in Parliament

Dangerous Chemicals (Road Conveyance)

IN the House of Commons on November 15 Colonel Goodman asked the Home Secretary if he would take steps to regulate the transport of acids and dangerous chemicals and other materials by road?

Sir J. Gilmour replied that the question of applying the provisions of the Petroleum (Consolidation) Act, 1928, to certain dangerous chemicals, with a view to regulating the conditions of their conveyance by road, was at present under careful consideration.

Colonel Goodman asked the Home Secretary whether his attention had been called to a road accident on the Great North Road in which the passengers on a motor coach were severely burned by acid spilled from carboys which were being carried on a lorry; and did he not think that steps should be taken speedily to restrict or safeguard the carriage of dangerous materials by road?

Sir J. Gilmour said he was aware of the circumstances of that case. One of the officials of the Home Office attended the inquest, and it was arising out of that case that these matters were under consideration.

Import Duties on Glue

Rising to move the approval of Additional Import Duties (No. 17) Order 1933, which relates to glue and gelatine, Dr. Burgin said these substances had been the subject of questions from time to time chiefly because of imports from abroad at prices which were wholly unremunerative to makers in those countries and made it very difficult for our home industry to compete with them. The glue was of various kinds and one kind, from osseine, was of particular interest. It was made from dried bones treated with hydrochloric acid. The advantage of this Order was that wherever one could make a useful substance by utilising large quantities of a by-product of another industry one achieved a double purpose, and the surplus stocks of hydrochloric acid in this country had presented a problem for some years. The development of the manufacture of glue and gelatine from osseine was important, and in the opinion of the Government the imposition of a duty of 10s. 6d. per cwt., or 25 per cent. of the value, whichever was the greater, on that class of goods, was a particularly happy recommendation which should have beneficial effects on the industry.

Mr. D. Grenfell said he would like to know why this industry required special protection. Bone was obtainable as a raw material in this country as cheaply and abundantly as anywhere else. Hydrochloric acid, and the benzine used in the special benzine process resorted to in the destruction of bone, as raw material in the manufacture of glue, were as easily obtainable in this country as in any country in the world. He did not think that it was satisfactory, when they had a surplus of hydrochloric acid, that they should raise artificially the price of the bone in order to use the hydrochloric acid which they had in abundance.

Compressed Gas as Motor Fuel

Filling Station Opened at Chesterfield

MR. ERNEST BROWN, secretary of the Mines Department, opened the first compressed gas filling station in the country on November 15 at the entrance to the works of the Chesterfield Tube Co., Ltd., at Chesterfield. The 200 transport, gas and coal representatives in attendance at the opening ceremony included officers from the Home Office, the Ministry of Transport and the Mines Department. Mr. W. A. Woodeson, chairman of the Chesterfield Tube Co., Ltd., presided at the opening and at a subsequent luncheon, at which Mr. Brown was presented with a silver miniature of the compressor as a souvenir of the occasion.

Immediately after Mr. Brown had set the apparatus in operation, half a dozen vehicles of various types drew up and fuelled, the charging in no case taking more than two minutes. The three storage cylinders, which are covered with insulating material and have an outside diameter of 21.5 in., are made from nickel chrome molybdenum steel, the normal storage pressure having naturally to be considerably higher than the maximum reached in the traction cylinders, since a reasonable reserve is required at all times to permit quick charging of vehicles one after another. The cylinders have a total water capacity of 72 cu. ft.

The use of gas as a fuel for the internal combustion engines of motor vehicles is by no means a novelty. The fundamental problem has always been to carry sufficient gas for an economic range of mileage, and recent experiments have largely overcome this difficulty and justified a more active interest being taken in the subject. Exacting tests were applied to the traction cylinders to be used for the compressed gas, and official sanction was obtained from the Home Office and the Ministry of Transport for the use of the cylinders under the direct supervision of the Chesterfield Tube Co., Ltd. As the result of close co-operation with the Bryan Donkin Co., Ltd., and the gas and transport departments of the Chesterfield Corporation a four-cylinder Bristol single decker omnibus lent by the corporation was converted for running on gas, with such favourable results that further vehicles were similarly converted. Suitable four and six-stage compressors capable of raising various capacities from 600 to 6,000 cu. ft. of free gas per hour to a pressure of 5,000 lb. per sq. in. for the refuelling of vehicles are now in service in different parts of the country and the installation of many new stations is receiving the serious consideration of the authorities concerned.

The compressing plant in operation at Chesterfield consists of a Bryan Donkin four-stage reciprocating compressor capable of passing on an average 100 cu. ft. of free gas per minute. During an actual running test approximately 7,000 cu. ft. of gas of a calorific value of 480 B.Th.U. was compressed in one hour, such test indicating that it would be possible to compress over 333,000 cu. ft. of gas per 48-hour week, or 17,000,000 cu. ft. per annum. Running costs, comprising attendant's wages, stores, maintenance, power and insurance amounted to 6s. 4½d. per hour, or 11d. per thousand cu. ft. of gas compressed. On a total capital outlay of £1,400, and allowing for interest and depreciation on capital invested, the additional cost is 2½d. per thousand cu. ft. of gas compressed. Calculated on the basis of these running costs and interest and depreciation charges, the costs are given as follows:—

"Dennis" Lorry, converted for Gas Propulsion.

Cost Price of Gas at Inlet of Compressor, per thousand cu. ft.	Total Cost per Thousand cu. ft. of gas compressed.	Total Cost of 250 cu. ft. of Gas Compressed, *i.e.*, equal to 1 gal. of petrol.
s. d.	s. d.	d.
1 0	2 1½	6¾
1 3	2 4½	7⅛
1 6	2 7½	7⅝
1 9	2 10½	8⅛
2 0	3 1½	9⅛
2 3	3 4½	10⅛
2 6	3 7½	10⅝

These figures show that the application of coal gas as a fuel has already passed the experimental stage. The number of vehicles converted is increasing rapidly. The expense of conversion is not excessive and it is estimated that the cost can soon be recovered as a result of the saving effected.

Notes and Reports from the Societies

Institute of Fuel

Prospects of Low Temperature Carbonisation

AT a meeting of the Institute of Fuel at St. Ermin's Hotel, London, on November 14, Mr. John Roberts discussed the question of "What is needed to make the low temperature carbonisation of coal a national industry." He expressed the view that direct State aid was unnecessary but the moral support of the Government would be a great help. He considered that a carbonising corporation should be formed, having sufficient financial backing to erect plants in every coalfield, of such type and size as to be suitable for the coals available and the proximity of the market. Under such a scheme the plants to be erected should be selected by a committee of technical experts, including one representative of the Fuel Research Board and one from the Coal Owners' Association. The corporation should have a central publicity department and sales organisation, together with a research department under its own control. It should keep a close watch on new developments at home and abroad in the treatment of coal and its derivatives, and any process warranting trial should be thoroughly tested.

The importance of the question from the national standpoint demands closer co-operation than has existed in the past, and a weeding out of many of the processes which are commercially and technically hopeless. The best commercial, engineering and technical talent should be enlisted for such a combine and there would then be no chance of a repetition of the scandals which have in the past done so much to ruin the industry. It would then be unsafe for inventors and company promotors to make far-reaching and all-embracing claims regarding processes which had not passed the drawing office stage, and such discreditable performances would be treated by responsible people with the contempt they deserve.

Society of Chemical Industry

Huddersfield Section: A Solid Carbon Dioxide

THE production of solid carbon dioxide was rendered possible by the fundamental discovery, by Andrews, of the critical state, said Major F. A. Freeth in speaking on "Drikold" before the Huddersfield Section of the Society of Chemical Industry, on November 21. It is difficult to overestimate the importance of Andrews' work industrially, and its importance in academic work must be considered even greater in view of the fact that Andrews' simple apparatus was taken as the starting point, at the University of Leyden, for the subsequent work of Professor Kramerlingh Onnes.

The ideas involved in the recognition of the critical state were discussed, and the necessity of its recognition in the production of solid carbon dioxide stressed. Major Freeth then described modern methods of producing solid carbon dioxide, showing numerous slides of the large solid CO_2 producing unit of I.C.I. at Billingham. He pointed out that I.C.I. had now found it possible, by means of a system of storage bins and highly insulated railway vehicles, to distribute "Drikold" throughout the length and breadth of the U.K. as effectively as one of the more usual products of industry, such as, say, soda ash. The perfecting of this distributing system involved an enormous amount of research, not only on insulation, but on the crystal structure of solid carbon dioxide and the changes which this substance undergoes during "ageing." The industry was growing rapidly, and although it had not yet reached the size in England that it had attained in the United States, it was, bearing in mind the different conditions in the two countries, progressing just as rapidly here.

Some of the more important applications of "Drikold" were touched upon. As examples of these, its use as a low temperature refrigerant for ice cream was described, its use as a source of CO_2 gas for the manufacture of mineral waters and the carbonisation of beer was touched upon, and a description given of its use as a refrigerant in the transport of perishables. In this last connection, the refrigerating power of solid CO_2, while valuable, was by no means the only reason for its success as a means of preserving foodstuffs. The CO_2 gas given off during the evaporation has very marked germicidal properties and is thus extremely important in preventing the growth of moulds on meat and in preventing decay in fish. The work of the Torry Research Station at Aberdeen—a department of the Food Investigation Board—was mentioned in this connection, and slides demonstrating the bactericidal action of CO_2 gas were shown.

Birmingham Section

A JOINT meeting of the Birmingham Section and the Plastics Group of the Society of Chemical Industry was held at the University on November 21, when Mr. George Dring (developments manager of Bakelite, Ltd.) gave a lecture on "Some chemical aspects of phenol-formaldehyde resins." Mr. Dring's lecture dealt with the chemical and technical aspect of manufacture, including questions of supplies of raw materials and chemical theories of resin manufacture, and made a strong plea for an extension of academic research work into the essential nature of synthetic resins.

Institution of Chemical Engineers

Annual Reception

THE annual reception of the Institution of Chemical Engineers was held on November 22, at the Waldorf Hotel, London, when guests numbering over 400 were received by the president, Viscount Leverhulme, and Viscountess Leverhulme. Following the formal reception, dancing was enjoyed and light refreshments were served. Among those who accepted invitations to be present were:—

Lord and Lady Reading, Lord and Lady Meston, the Hon. H. Fletcher Moulton, Sir Ernest and Lady Benn, Sir Robert and Lady Hadfield, Sir Hugo and Lady Hirst, Sir Richard and Lady Gregory, Sir Henry Maybury, Sir Frank Smith, Sir Robert and Lady Robertson, Sir Wm. and Lady Alexander, Sir Joseph Petavel, Sir Francis and Lady Goodenough, Sir Ernest Graham-Little, M.P., and Lady Graham-Little, Sir Christopher and Lady Clayton, Mr. and Mrs. W. Gordon Adam, Mr. and Mrs. J. H. Aiken, Mr. and Mrs. J. R. W. Alexander, Mr. and Mrs. E. A. Alliott, Professor and Mrs. E. N. da C. Andrade, Dr. and Mrs. E. F. Armstrong, Professor H. E. Armstrong, Professor E. C. C. Baly, Dr. and Mrs. S. G. Barker, Major and Mrs. L. J. Barley, Dr. and Mrs. G. D. Bengough, Mr. and Mrs. C. Valon Bennett, Professor W. A. Bone, Professor and Mrs. J. S. S. Brame, Professor and Mrs. H. V. A. Briscoe, Dr. and Mrs. H. J. Bush, Mr. W. J. A. Butterfield and Miss Butterfield, Mr. and Mrs. W. A. S. Calder, Dr. and Mrs. H. T. Calvert, Dr. and Mrs. F. H. Carr, Mr. and Mrs. S. E. Carr, Mr. Alan Chorlton, M.P., and Miss Chorlton, Dr. and Mrs. R. T. Colgate, Dr. and Mrs. H. E. Cox, Mr. and Mrs. H. W. Cremer, Mr. A. C. Cross (Editor of THE CHEMICAL AGE), Dr. and Mrs. Wm. Cullen, Mr. and Mrs. W. A. Damon, Professor and Mrs. C. H. Desch, Dr. and Mrs. C. V. Drysdale, Dr. and Mrs. J. T. Dunn, Dr. and Mrs. A. E. Dunstan, Mr. and Mrs. E. C. Evans, Mr. E. V. Evans, Dr. J. Vargas Eyre, Dr. Margaret Fishenden, Dr. and Mrs. J. J. Fox, Mr. and Mrs. C. S. Garland, Professor and Mrs. W. E. Gibbs, Mr. and Mrs. Geo. Gray, Mr. and Mrs. F. A. Greene, Dr. Ezer Griffiths, Dr. and Mrs. R. E. V. Hampson, Dr. W. H. Hatfield, Mr. F. T. Hatswell, Dr. and Mrs. G. W. Himus, Professor and Mrs. B. W. Holman, Dr. L. A. Jordan, Mr. and Mrs. J. A. J. Kewley, Dr. and Mrs. L. H. Lampitt, Mr. and Mrs. C. LeMaistre, Dr. and Mrs. R. Lessing, Dr. and Mrs. H. Levinstein, Mr. and Mrs. Donald McDonald, Mr. and Mrs. J. MacGregor, Mr. C. J. T. Mackie, Mr. and Mrs. G. S. W. Marlow, Dr. and Mrs. Stephen Miall, Mr. Emile Mond, Professor and Mrs. G. T. Morgan, Mr. and Mrs. E. M. Myers, Dr. and Mrs. W. R. Ormandy, Dr. and Mrs. R. H. Pickard,

Mr. and Mrs. R. B. Pilcher, Mr. and Mrs. H. L. Pirie, Mr. and Mrs. H. J. Pooley, Mr. P. C. Pope, Mr. B. D. Porritt, Mr. and Mrs. H. V. Potter, Mr. and Mrs. J. Davidson Pratt, Mr. S. R. Price, Professor and Mrs. H. Raistrick, Professor and Mrs. A. O. Rankine, Mr. and Mrs. Eric Reavell, Mr. and Mrs. J. Arthur Reavell, Mr. and Mrs. J. F. Ronca, Dr. and Mrs. R. Seligman, Captain and Mrs. J. Fraser Shaw, Dr. and Mrs. F. S. Sinnatt, Dr. E. W. Smith, Mr. and Mrs. H. M. Spiers, Mr. and Mrs. H. Talbot, Professor and Mrs. J. F. Thorpe, Mr. and Mrs. H. T. Tizard, Mr. and Mrs. S. J. Tungay, Dr. A. J. V. Underwood, Professor and Mrs. S. G. M. Ure, Mr. and Mrs. J. A. Frome Wilkinson, Mr. J. Arthur Williams, Mr. W. H. Woodcock, Mr. C. B. Woodley and Miss W. Wright.

Additional Meeting

AN extra meeting of the Institution of Chemical Engineers is being arranged to take place on November 29 in the Chemical Society's Rooms at Burlington House, London, when a paper entitled: "The Mechanical Properties of Metals at Low Temperatures: Part II.—Non-Ferrous Materials," will be presented by Mr. E. W. Colbeck and Mr. W. E. MacGillivray. The chair will be taken at 6 p.m. by Mr. H. Talbot (vice-president). This paper is a continuation of the work which was presented before the Institution in May last, and embodies recent research on non-ferrous metals.

British Association of Chemists

Scottish Section: Ultra-Violet Radiation Tests

AN interesting survey of recent applications of the ultra-violet radiation test was given by Mr. John Muir, of Robert Puller and Sons, Ltd., Dunblane, at a meeting of the Scottish Section of the British Association of Chemists, held in Glasgow, November 15. Mr. Muir illustrated his remarks with a practical demonstration of fluorescence comparisons on a large assortment of industrial products covering many trades and industries.

In his opening remarks Mr. Muir said the mercury vapour lamp as used in most equipment for the exciting of fluorescence, has a spectrum ranging from 6,000 A.U. to 2,300 A.U. When a dark filter similar to Wood's glass is used, the greater part of the visible radiation is absorbed as also is, unfortunately, the lower ultra violet, but as long as the band from 3,000 to 4,000 A.U. is transmitted through the filter, it is possible to excite a wide variety of fluorescence. Special filters can, of course, be prepared to transmit a greater proportion of ultra violet and to exclude visible light almost entirely, but in ordinary practice the commercially possible filter is used.

For all practical purposes it may be considered that the most useful forms of apparatus are those which use the mercury vapour lamp as a light source, and of these there is quite a variety in use in this country, France, Germany and in America. The mercury vapour lamp is of course, a relatively expensive unit and an ingenious instrument such as the Ultra-Vioscope which provides for the examination of fluorescent materials using solar radiation as the light source, brings the subject of fluorescence analysis within the reach of most chemists. The Ultra-Vioscope is a development from its predecessor the Callophane which was purely a daylight instrument, or at least has to be used in conjunction with an external light source, but the Ultra-Vioscope can be supplied fitted with an ultrasol lamp which is a small mercury vapour lamp, giving a satisfactory output of ultra violet rays. As far as I am aware, there is no low priced apparatus of such wide application as the Ultra-Vioscope, and although it is not so easily portable as the Callophane, it may certainly be carried about in its case without any serious inconvenience. Of the mercury vapour lamps specially designed for the purpose of fluorescence analysis, there is the fluorescence cabinet of Kelvin, Bottomley and Baird, and the Hanovia utility lamp of the Hanovia Quartz Lamp Co.

The subject which has been described as fluorescence analysis is not yet old enough to have developed any established technique, and although remarkable efficiency is possible in applied as well as in pure science, each serious worker at the present time must be considered to be a pioneer. For this reason, it is of first importance that accurate records of work should be kept, and that there should be wider publication of alternatives in technique and method. It is of first importance that the spectrogram of the filters used should be observed to enable the investigator to correlate his work with other recorded results. This, however, only helps to a limited extent towards standardisation of the tests involved because the characteristics of the fluorescence produced will vary not only according to the absorption characteristics of the filter, and also according to the condition and age of the mercury vapour lamp. It is also important, when control observations are being taken, that the amperage being consumed by the lamp be noted and recorded alongside the variable data of the resistance used. The preliminary examination of specimens should always be undertaken in their natural condition, and it is important to bear in mind that it takes at least five minutes for the mercury vapour lamp to reach its normal output of radiation, and a like period for the eyes to acclimatise themselves to the darkness. Examinations undertaken by merely shutting out extraneous light as far as possible by means of the curtains provided on the various types of apparatus, are seldom satisfactory. After the specimen has been subjected to a preliminary examination in its natural condition, it may be pulverised should that be practicable, and also dissolved in a suitable non-fluorescent solvent.

Solvents may be used to facilitate qualitative tests, since a wide variety of characteristic appearances can be obtained by a range of solvents. As far as possible solids and powders should be examined on non-fluorescent porcelain basins. Liquids are best observed in quartz tubes or tubes of non-fluorescent glass. Microscope slides and cover glasses will be found to be of great service in the examination of small quantities of material or in making preliminary tests particularly of oils, fats and waxes.

With the Hanovia lamp, the Kelvin Bottomley and Baird lamp and the Ultra-Vioscope (Griffin and Tatlock), Mr. Muir exhibited for the first time the Muir ultra violet comparator, shortly to be offered by Watson and Sons (Electrical-Medical) Ltd. This comparator is a more ambitious instrument than has yet been offered to industrial and research workers, providing as it does for all kinds of fluorescence comparisons including projection and microscope work, and in addition for tests on the irradiation of solid and fluid materials in a specially designed compartment. There are also facilities for examination of substances in solution and in their normal state by transmitted radiation. It is intended that tests should be standardised and charted by controlled conditions of amperage so that the test may be made as specific as possible.

Institute of Chemistry

General Institute Lecture Held at Leeds

ELECTROMETRIC methods in physical and analytical chemistry, was the subject of a general lecture to the Institute of Chemistry at Leeds on November 20. Electrometric methods, said Dr. S. Glasstone, may be conveniently divided into two sections, namely conductometric and potentiometric. Determinations of conductivity have played an important part in the development of the modern theory of electrolytes and have also been used to study the hydrolysis of salts, the solubility of sparingly soluble salts, the ionic product of water and the dissociation constants of acids and bases. Apart from matters of theoretical interest, conductometric methods have found application in analytical work; the neutralisation of strong and weak acids—alone and in mixtures the displacement of a weak acid from its salt by a strong acid, and the precipitation of insoluble salts may be followed by conductometric titration. The chief development in the technique of conductivity measurement concerns the use of the thermionic valve as a source of symmetrical A.C., various methods for its rectification so as to permit the use of direct current instruments as detectors, and simplification of the apparatus for conductometric titration. By measuring the E.M.F.'s of suitable cells it is possible to determine the transport numbers of ions, the valency of ions and the heats of certain reactions

with considerable accuracy. The study of single electrode potentials is important for the determination of pH; for this purpose various electrodes, *e.g.*, hydrogen, oxygen, air, antimony, quinhydrone and glass, have been used. The amplifying properties of the thermionic valve have been applied, both with and without a potentiometer, to measure E.M.F.'s of high and low resistance cells, particularly for purposes of potentiometric titration.

A potentiometric method of a quite different type, continued Dr. Glasstone, is that involving the dropping mercury cathode; the apparatus, known as a "polarograph" is of the automatic self-registering type and by means of it solutions containing as little as 10^{-6} g. mol. per litre of any ion or reducible substance may be analysed. The apparatus has also been used in connection with fundamental physical problems, such as overvoltage, electrolytic reduction and the stability of complex ions.

Oil and Colour Chemists

Manchester Section : Annual Dinner and Dance

THERE was a large attendance at the ninth annual dinner and dance of the Manchester Section of the Oil and Colour Chemists' Association, at the Manchester, Ltd., Royal Exchange, on November 18. Mr. Cecil J. T. Cronshaw, managing director of the Dyestuffs Group, Imperial Chemical Industries, Ltd., proposed the toast of the Section and remarked that it was a matter upon which they were to be congratulated that they had managed to live for so long, so far away from the main body.

Dr. V. B. Jolly, vice-chairman of the Manchester Section, responded and commented upon the fact that the chemist was a much maligned person, although there were signs that he was apparently becoming better understood. One of the great problems to which they had to apply their minds was that of getting people to use more paint and to use it properly. Paint had been in use for many years but it was only latterly that the chemist had come in and put the industry on a better foundation than before. With the advent of new materials and with the organisation of the Association the industry really seemed to have taken a new turn, offering much better prospects for the future.

Mr. A. Hancock, chairman, proposing the guests, said the Section was formed ten years ago and it had steadily improved in every way year by year. He conveyed to those present the apology of Mr. J. A. F. Wilkinson, for his inability to be with them on that occasion. Professor H. V. A. Briscoe, in responding, congratulated the Manchester Section on the success which it had undoubtedly achieved.

Institution of the Rubber Industry

Manchester Section : Naphtha-laden Atmospheres

A RAPID method for the analytical examination of naphtha-laden atmospheres was described by Dr. D. F. Twiss and Mr. F. A. Jones, at a meeting of the Manchester Section of the Institution of the Rubber Industry, on November 20. The authors gave a general discussion of the fire-risk involved in the use of the ordinary rubber solvents. An adaptation of the miner safety lamp to the determination of the proportion of the vapour of such inflammable solvents up to the inflammable limit was indicated.

The lamp in question uses a Colza oil flame which is adjusted to a height of 20 mm. In atmospheres containing hydrocarbon solvent vapours of the type used in the rubber industry the height of the flame increases by 30 mm. or a little over before the explosive or inflammable proportion is reached. It is consequently possible by suitable preliminary measurements to use such a lamp for the rapid estimation of the proportion of naphtha vapour up to the inflammable or explosive limit. The lamp can also be used for the estimation of the proportion of other vapours such as alcohol or acetone; the calibration, however, is then on a different scale. If the proportion of combustible vapour exceeds the inflammable or explosive limit the lamp extinguishes itself. The advantages of such a test include rapidity and the ease with which the course of currents of inflammable vapour can be followed. The method cannot be applied to carbon disulphide vapours on account of the excessive ease with which the vapour of this liquid ignites.

Vulcanisation of Rubber

In a second paper on the vulcanisation and reinforcing of rubber, Dr. Twiss said that it had been suggested that the effect of vulcanisaton was due merely to the formation of a colloidally fine dispersion of sulphur in the rubber without chemical action. This, however, was clearly contradictory to the simple experimental facts. There were striking resemblances between unvulcanised rubber, reinforced with carbon black, and vulcanised rubber, particularly in regard to their resistance to normal rubber solvents such as benzene. It appeared to be the case that the effect of vulcanisation by sulphur resulted, at least in part, by the formation of a compound of sulphur with part of the rubber in a state of colloidal dispersion in the remaining rubber which served as the dispersion medium. By this conception it was possible to explain the main features of the vulcanisation process.

Mineralogical Society

Anniversary Meeting

THE following were elected officers and members of council of the Mineralogical Society on November 9:—President, Sir Thomas H. Holland; vice-presidents, Sir William H. Bragg and Mr. Arthur Russell; treasurer, Mr. F. N. Ashcroft; general secretary, Mr. W. Campbell Smith; foreign secretary, Professor A. Hutchinson; editor of the Journal, Dr. L. J. Spencer; ordinary members of council, Professor C. E. Tilley, Professor P. G. H. Boswell, Professor H. L. Bowman, Dr. L. Hawkes, Dr. W. R. Jones, Dr. F. Coles Phillips, Mr. J. B. Scrivenor, Mr. F. A. Bannister, Mr. T. Crook, Dr. W. F. P. McLintock, Mr. L. R. Wager, Dr. A. K. Wells.

Dyeing Industry Wages

Employers' Attitude towards Arbitration

NEGOTIATIONS in the dyeing and finishing industry in Yorkshire, Lancashire, Cheshire, Derbyshire, and parts of Scotland, regarding wages and hours, appear to have broken down. The proposals made by the Federation of Unions in the bleaching, dyeing, finishing, and calico printing trades were originally considered at a joint meeting with the Allied Association of Bleachers, Dyers, Printers and Finishers on July 17. On the employers intimating their inability to concede the application, the Federation decided in October to "notify the emplpoyers that a dispute has arisen under the terms of the general agreement and that the machinery established therein for the prevention of disputes should forthwith be brought into operation."

This was an effort to secure arbitration on the Federation's proposals. In reply, the Allied Association on November 13 expressed the opinion that the function of the Reference Board set up under the agreement of February 18, 1932, is to deal with "any dispute or question arising under this agreement. A dispute can only arise in a case of alleged non-fulfilment of the provisions within the agreement. No such dispute has arisen, and the Allied Association cannot agree to the application being dealt with by the Reference Board." The communication also pointed out that the Assotiation found themselves "compelled to intimate that the trade is unable to concede any variation of present conditions which would increase the cost of production."

The employers' letter was discussed by the Federation's executive committee in Bradford on November 20. Mr. Charles Hewitt (Bolton) presided, and after the conference Mr. Arthur Shaw, secretary), stated that it had been decided to call a meeting of the full executive committees of the constituent unions at Bradford on December 2, to consider further action.

Imperial Smelting Corporation

A Notable Increase in Acid and Spelter Production

THE activities of the Imperial Smelting Corporation, Ltd., and its subsidiaries, were reviewed at the fourth annual ordinary general meeting of the Corporation held at River Plate House, London, on November 16, when Sir Robert Horne, M.P. (chairman of the company), presided.

Sir Robert said the Corporation's most important operations and largest investment are connected with the National Smelting Co., which owns the extensive roasting, acid and spelter works at Swansea Vale and Avonmouth. Operations at Avonmouth and Swansea Vale are largely confined to the production of sulphuric acid and spelter. Acid production, which in 1931 reached 84,000 tons, rose to 98,000 tons in 1932, and for the current year will be over 100,000 tons. This year the acid plants have been running entirely on zinc concentrates, while in the previous years the company was forced by the poor demand for metal to supplement zinc concentrates with pyrites. Spelter production has risen from 18,230 tons in 1931, to 23,850 tons in 1932, and an estimated 39,000 tons for 1933.

Early in October the Imperial Smelting Corporation announced the acquisition of the Seaton Carew acid, spelter and zinc oxide works of the Sulphide Corporation, and the purchase of the share capital of the Delaville Spelter Co., which produces spelter, zinc-dust and zinc-oxide. The former works are near West Hartlepool; the latter at Bloxwich, in the Birmingham district. A subsidiary—Improved Metallurgy, Ltd.—is erecting a vertical retort zinc distillation and refining plant at Avonmouth.

Vertical Retorts for Zinc Distillation

For some years past the Imperial Smelting Corporation has been kept in close touch with the developments of a process for the distillation of zinc in vertical retorts which was in operation at the works of the New Jersey Zinc Co. in the United States. The most careful investigation of their process was made, and in order to make doubly sure of its advantages extensive and exhaustive tests have been carried out. The reasons for the Corporation's interest in this new process should be made clear. They have a very large investment of capital in the zinc industry in the United Kingdom, the protection of which is essential. They were confronted with the ever-increasing competition of the higher grade metal produced electrolytically, and they had so far failed to meet one of their major objectives, *viz.*, to produce a metal of a grade sufficiently high to meet the Government's requirements in times of national emergency. The Corporation has, therefore, purchased the patents concerned and the exclusive rights to use them within the United Kingdom. These patents are divided into two sections—the first covering the vertical retort itself, and the second the refluxer, or refining, furnace.

It is estimated that the new vertical retort plant will be running within twelve months, but much before that date, by the use of the "refining patents," should be turning out a metal containing 99.99 per cent. zinc—the purest metal called for by any consumer. The refining process can be adapted for improving metal produced from the horizontal retort, and also raising it to 99.99 per cent. zinc and over.

The purchase of the Sulphide Corporation's interests at Seaton Carew carries with it the whole of the output of zinc concentrates from the Central Mine at Broken Hill for the remainder of its life. This is an important factor to the Imperial Smelting Corporation for the main objective behind the formation of this company and its predecessor was to assist in establishing the spelter industry. The present consumption of zinc in the United Kingdom is between 125,000 and 130,000 tons.

Zinc White and Lithopone

The Corporation's interest in lithopone (Orr's Zinc White, Ltd.) has again shown expansion and fully justified the enterprise of the management, under the directorship of Mr. Donald Orr, in extending the works. Two developments of considerable importance have to be recorded in this business. The first is the acquisition of patents and process rights for the production within the United Kingdom of zinc sulphide by a new method. This new process is a very considerable improvement on any other at present in existence. The second development is that the Corporation are proceeding to use, through the Western Lithopone and Barytes Co., a site at Avonmouth, where the production of lithopone and zinc sulphide will be gradually commenced.

In the zinc oxide trade, success has not yet been so great. In an oversupplied market, there has been competition between manufacturers to an extent involving undue reduction or even complete elimination of profits.

Titanium Pigments

British Titan Products, Ltd., has now commenced the erection of its works for the production of titanium pigments at Billingham. Very satisfactory progress is being made and it is expected that production will commence before the middle of 1934. In the meantime, business is being profitably carried on by importations. The Corporation's interest in this company is a minority one, amounting to 17 per cent. only of the new capital.

Sulphuric acid output is estimated to show an increase in the not distant future and the Corporation have naturally been seeking means of increasing consumption to the point of production. They have been fortunate in coming to an arrangement with the British Aluminium Co. for the erection of a plant at Avonmouth to produce sulphate of alumina.

Indian Chemical Industries

Progress in Bombay Presidency

THE heavy chemical industry in Bombay during the past year, did not do well, says the report of the Industries Department. There were three manufacturing concerns in existence at the beginning of the year and one more was started during the year to manufacture magnesium chloride. This latter concern did fairly well, and its prospects are assured owing to the extension of protection to the industry. The other factories, however, worked at a loss. The paint industry showed signs of improvement. A well-known British firm has bought the interests of one of the largest paint and varnish works in Bombay and is erecting a modern and up-to-date plant for the production of these products.

The manufacture of gas mantles is also making good progress and three new factories were started during the year, bringing the total to five. The difficulty of obtaining chemicals, however, is still there. The manufacturers get their supplies with great difficulty at a very high cost. With a view to meet the great difficulty in obtaining sufficient quantities of thorium nitrate for the manufacture of gas mantles, the Industries Department has undertaken to find out an economic process, suitable for local conditions, for the preparation of this chemical from monazite sand which is obtained from Travancore.

The soap manufacturing industry has grown very rapidly in Bombay and there are nearly 40 companies now working. An estimate of production is not available, but a rough idea can be had from the figures of imports of caustic soda into Bombay, which is mostly used for the soap industry. These imports increased from 2,900 tons in 1931-32 to 3,920 tons in 1932-33. As a result of the rapid growth of the local industry, the imports of soap are dwindling, and Bombay is now the largest exporter of Indian soap, chiefly to Iraq.

Two new factories have been started for the manufacture of bakelite electrical fittings. Experimental work for preparing tallow substitute from vegetable oils for the textile mills has shown that this is possible by hydrogenation of a mixture of vegetable oils in a certain proportion. It has also been established that pulp suitable for paper manufacture can be prepared from rice straw.

News from the Allied Industries

Building Products

SHAREHOLDERS of British Plaster Board, Ltd., are to be asked by the directors to sanction an increase in the capital of the company from £100,000 to £250,000. During the past six months the new plant, stated by the chairman at the last annual meeting to be in course of erection at the company's works at Wallasey, has come into operation, and has worked at full capacity. Since then it has been found necessary to extend operations still further, and the directors have entered into a contract for the purchase of land and factories at Erith, Kent, where a plant will be erected.

Mineral Oil

THE DEUTSCH-AMERIKANISCHE PETROLEUM-GESELLSCHAT, the German distribution company of the Standard Oil Co., announces that it has made contracts with the I. G. Farben and the Deurag Refineries at Hanover, under which the company will be first obliged to buy the surplus production of these companies before importing American petrol.

Dyeing

IN THE CHANCERY COURT at Manchester, on November 20, Mr. R. Peel, K.C., sitting as the Deputy of the Chancellor, heard an application by the Waterdale Dyeing and Finishing Co., Ltd., Mere Clough, Prestwich, for confirmation of a reduction of capital which involved a repayment of £14,000 to the shareholders. Mr. C. E. R. Abbott, for the company, said the present capital was £70,000 in £1 shares fully paid. It was proposed to return 4s. per share, reduce the shares to 16s., making the capital £56,000, and, on the reduction becoming effective, increase the capital to £70,000 by creating 70,000 new shares of 4s. each. The company had £37,838 invested and £110,000 to the credit of the reserve account, and the indebtedness to creditors was £13,209. The application was granted.

Iron and Steel

A FURTHER adjournment for four weeks of the petition by Mr. Bernard Augustus Holland, Chelsea, London, for the compulsory winding up of the Darlington Rustless Steel and Iron Co., Ltd., was granted by Mr. Justice Maugham in the Chancery Division, November 20. The petition was supported by Dorman, Long and Co. and the Darlington Corporation, and was opposed by the company and creditors for about £15,000. Mr. Lionel Cohen, K.C., and Mr. Wynn Parry (instructed by Windybank, Samuell and Lawrence) appeared for the petitioner and supporting creditors; and Mr. Jenkins, K.C., and Mr. Cecil Turner (instructed by Clifford, Turner, Hopton and Lawrence) for the respondents.

THE ENGLISH STEEL CORPORATION, LTD., has decided to spend an additional £500,000 in continuation of the programme of reorganising and bringing up to date its extensive plant at the Vickers Works, Sheffield. The Corporation, which comprises the steel interests of Vickers, Armstrong Whitworths, Cammell Lairds, Darlington Forge and Industrial Steels, Ltd., has at Sheffield the largest drop-stamping plant in the country. It is understood that the money will be expended chiefly on that department, and on the extension of facilities for the heat treatment of special steels. Provision is also made for the installation of one further open-hearth furnace in the new steel melting house, completing a battery of four 60-ton furnaces.

Rubber

THE AVON INDIA RUBBER CO. point out in their annual report that the continued progress of the company renders desirable further modernisation and extension of the works. In order to provide the necessary capital for these operations and to pay off bank advances, it is proposed to increase the capital to £600,000 by the creation of 225,000 6 per cent. cumulative preference shares of £1. During the past year the company did well, the net profit being £40,577, while the dividend on the ordinary shares is increased to 8 per cent.

Paper

THE SWEDISH PULP CO. has now reduced its share capital from 100 million to 30 million kroner; this has enabled the company to wipe out its losses and to write down book values. The report for the past year shows a net loss of 2.38 million kronor, against a loss of 23.2 millions for the preceding year; earlier losses were caused by the Kreuger and Toll collapse. Work at the pulp mill at Oestrand was not begun until 1932, and the full effect of its operations is not shown in the past year's report. The company controls about a dozen Swedish timber and pulp companies, with a total annual output of 300,000 tons of sulphite pulp, 220,000 tons of sulphate pulp, and 210,000 tons of mechanical pulp.

CONSIDERABLE INTEREST is being evinced in the European sulphite producers' conference in Copenhagen. It is expected that important decisions may arise regarding production and prices next year. The rate of curtailment agreed to for the present year was 25 per cent. The present agreement terminates at the end of the year and unless an alternative proposal is presented the producers would be at liberty to go on full output.

Linseed Soft Soap

A New Bleaching Process

IN Germany and certain other Continental countries linseed oil is very largely used for the manufacture of yellow soft soap. The colour of this soap has been found to be of peculiar significance to the user, and, inasmuch as the product sells at a low price and a light colour is demanded, it is essential that the manufacturer choose a bleaching process entailing as little expense as possible. The soap cannot be bleached simply with chlorine, as the odour remains even though the residual chlorine liquor may be completely removed from the treated soap. The chlorine combines with the albuminous constituents of the oil, producing a compound having a strong chlorine odour.

This problem has now been investigated by Dr. T. Ruemele, a German chemist, and as a result he reports that it is first necessary to treat the linseed oil so that its albuminous constituents are removed. In the past the commonest process has been to allow the linseed oil to settle in suitable tanks or to filter it. This procedure, however, removes only the insoluble albuminous substances in the oil. Chemical methods must be used to precipitate the soluble albumins, which can then readily be removed. It is, of course, essential that the presence of soluble albumins in the oil should be determined before subjecting it to this treatment. Soluble albumins are present when a flocculent separation is obtained in a sample of the clear oil heated rapidly to about 270° C. The linseed oil should be heated for half-an-hour at a temperature of 90° C. while being agitated, and then filtered. This treatment effectively removes all the soluble albumins. When purified linseed oil of this type is used in the manufacture of soft soap the product can readily be bleached with inexpensive chlorine bleaching liquors.

Bengal Salt Imports

THE total quantity of foreign salt imported into Bengal in the year 1932-33 amounted to 413,000 tons, valued at Rs. 55 lakhs. The Collector of Customs, remarks that the total quantity of salt entered for home consumption at Calcutta was less than in any of the three previous years, the decrease being distributed between imports from the United Kingdom and Aden, all other varieties showing appreciable increases. During the first half of the year, large quantities of Aden salt were consumed, but thereafter imports from other foreign ports predominated. There was a substantial fall in prices during the year and there are no indications of an early return to the former price level.

Inventions in the Chemical Industry

Specifications Accepted and Applications for Patents

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

HIGH MOLECULAR POLYMERISATION PRODUCTS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). March 3, 1932. 401,297.

HYDROCARBONS, treatment.—Sharples Speciality Co. March 5, 1931. 401,298.

CARRYING OUT fermentations.—J. Y. Johnson (I. G. Farbenindustrie). April 1, 1932. 401,284.

SOAP, manufacture.—J. E. Pointon, Baker Perkins, Ltd., and Anciens Etablissements A. Savy, Jeanjean, et Cie. April 26, 1932. 401,285.

UNSATURATED HYDROCARBONS from paraffins, production.—H. Dreyfus. April 28, 1932. 401,286.

OIL-SOLUBLE artificial resinous materials and the use thereof.—Imperial Chemical Industries, Ltd., A. Hill, R. Hill and E. E. Walker. April 28, 1932. 401,290.

AROMATIC COMPOUNDS, manufacture.—I. G. Farbenindustrie. April 29, 1931. 401,312.

METHODS for the introduction of NH_2 groups into organic and inorganic compounds.—O. T. Krefft. May 4, 1931. 401,302.

OXYGENATED organic compounds, manufacture.—H. Dreyfus. April 30, 1932. 401,269.

COLORATION of textile materials made of or containing cellulose esters or ethers. British Celanese, Ltd., G. H. Ellis and H. C. Olpin. May 4, 1932. 401,338.

COLOUR PICTURES from silver pictures, process.—W. W. Groves (I. G. Farbenindustrie). May 5, 1932. 401,340.

SOLID GREASES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). May 6, 1932. 401,295.

LUBRICATING OILS, manufacture.—Standard Oil Development Co. June 11, 1931. 401,341.

COATING COMPOSITIONS.—Imperial Chemical Industries, Ltd., A. Hill, R. Hill and E. E. Walker. May 9, 1932. 401,309.

HYDROCYANIC ACID, manufacture.—Roessler and Hasslacher Chemical Co. May 14, 1931. 401,351.

REACTION PRODUCTS of ketones and amines.—Naugatuck Chemical Co. May 16, 1931. 401,353.

PYRIDINE DERIVATIVES, manufacture.—J. P. Wibaut and H. J. Den Hertog, jun. May 21, 1931. 401,356.

SOLIDIFYING liquid hydrocarbons and products thereof, processes.—L. Mellersh-Jackson. May 12, 1932. 401,357.

AMMONIUM-MAGNESIUM PHOSPHATE, process for manufacture.—C. D'Asseev. June 22, 1931. 401,407.

AMINO COMPOUNDS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). July 15, 1932. 401,435.

NICKEL CARBONYL, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). July 18, 1932. 401,438.

TREATMENT of tanned or non-tanned animal hides.—I. G. Farbenindustrie. Oct. 3, 1931. 401,481.

FRACTIONAL DISTILLATION of volatile liquids and other processes of contacting immusculble fluids of different densities.—W. J. Podbielniak. Oct. 13, 1932. 401,484.

PROCESS for producing spirits by fermentation of materials containing carbohydrates.—Akt. Dansk Gaerings-Industri. Nov. 19, 1931. 401,495.

CRACKING of hydrocarbons by heating under pressure in the liquid phase.—C. Still (trading as C. Still). Dec. 17, 1931. 401,508.

FERTILISING SALTS.—H. Grah. Jan. 11, 1932. 401,520.

ARTIFICIAL MASSES, manufacture.—Soc. of Chemical Industry in Basle. Feb. 5, 1932. 401,535.

DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. Feb. 18, 1932. 401,544.

AMMONIUM CHLORIDE and sodium carbamate, manufacture.—Mathieson Alkali Works. March 24, 1932. 401,554.

MONOALKYL ETHERS of protocatechnic aldehyde, method of making.—J. D. Riedel-E. De Haen Akt.-Ges. March 21, 1932. 401,562.

ALKALINE HYDRATES from silicates, process for obtaining.—F. Jourdan. March 18, 1932. 401,567.

HORMONE of the corpus luteum, process of purifying.—Soc. of Chemical Industry in Basle. April 27, 1932. 401,574.

OXIDIC ZINC ORES, process of, and apparatus for, treating.—A. Pearson. April 13, 1933. 401,588.

ANTICRYPTOGAMIC POWDER having a copper oxychloride base, process and device for industrial manufacture.—L. Ferri. May 19, 1933. 401,603.

SODIUM CHLORIDE, extraction or purification.—R. Hara. June 14, 1933. 401,612.

ALKALI CYANIDES, manufacture.—Naamlooze Vennootschap Stikstofbindings-Industrie Nederland. Aug. 4, 1932. 401,627.

Complete Specifications Open to Public Inspection

ACID SOLUTIONS, preparation.—I. G. Farbenindustrie Feb. 23, 1932. 985/33.

PHOSPHOROUS CHLORIDES, method of packing.—I. G. Farbenindustrie. March 10, 1932. 987/33.

CONDENSATION PRODUCT of castor oil with half ester of maleic acid.—Resinous Products and Chemical Co. May 10, 1932. 4922/33.

RUBBER DERIVATIVES, manufacture.—I. G. Farbenindustrie. April 16, 1932. 11361/33.

CORPUS LUTEUM HORMONE, production.—Schering-Kahlbaum Akt.-Ges. May 9, 1932. 11729/33.

AMMONIUM COMPOUNDS.—Atmospheric Nitrogen Corporation. May 13, 1932. 13186/33.

ESTERS and compositions containing same.—E. I. Du Pont de Nemours and Co. May 7, 1932. 13367/33.

LUMINESCENT INORGANIC GLASS, method of producing.—Glaswerk G. Fischer. May 9, 1932. 13515/33.

WETTING, penetrating, dispersing, foaming, and cleansing agents.—Chemische Fabrik Stockhausen et Cie. May 9, 1932. 13537/33.

AZO DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. May 10, 1932. 13606/33.

AZO DYESTUFFS of the stillbene series, manufacture.—I. G. Farbenindustrie. May 11, 1932. 13625/33.

PROCESS for producing fast dyeings and printings on animal fibres by means of acid mordant dyestuffs.—Durand and Huguenin Akt.-Ges. May 12, 1932. 13761/33.

DERIVATIVES of the anthraquinone series, manufacture.—I. G. Farbenindustrie. May 11, 1932. 13781/33.

DYESTUFFS, manufacture.—I. G. Farbenindustrie. May 11, 1932. 13785/33.

HYDROCARBON MOTOR FUELS from oxygen-containing organic compounds, preparation.—Dr. A. A. Jana. May 12, 1932. 13876/33.

SYNTHETIC RESINS, manufacture.—E. I. Du Pont de Nemours and Co. May 13, 1932. 13982/33.

DEOXIDISING STEEL, process.—Soc. D'Electro-Chimie, D'Electro-Metallurgie, et Des Acieries Electriques D'Ugine. July 20, 1931. 31640/33.

DEPHOSPHORISING STEEL, process.—Soc. D'Electro-Chimie, D'Electro-Metallurgie et Des Acieries Electriques D'Ugine. Aug. 31, 1931. 31641/33.

Applications for Patents

DETERGENT COMPOUNDS, manufacture.—E. I. Du Pone de Nemours & Co. Nov. 6. (United States, Nov. 4, '32.) 30810.

RUBBER, preservation.—E. I. Du Pont de Nemours and Co. Nov. 8. 31075.

DETERGENT COMPOUNDS, manufacture.—E. I. Du Pont de Nemours and Co. Nov. 8. (United States, Nov. 8, '32.) 31167.

AZO DYESTUFFS, manufacture.—I. G. Farbenindustrie. Nov. 3. (Germany, Nov. 5, '32.) 30584.

CHLORINATED OLEFINES, manufacture.—I. G. Farbenindustrie and J. Y. Johnson. Nov. 2. 30497.

APPARATUS for manufacture of salts in form of coarse crystals.—I. G. Farbenindustrie and J. Y. Johnson. Nov. 8. 31090.

ORGANIC MERCURY COMPOUNDS, manufacture.—I. G. Farbenindustrie. Nov. 3. (Germany, Nov. 5, '32.) 30585.

DYESTUFFS of oxazine series, manufacture.—I. G. Farbenindustrie. Nov. 3. (Germany, Nov. 3, '32.) 30616.

POLYMERIC CARBOXYLIC ACIDS, manufacture of products from.—I. G. Farbenindustrie. Nov. 6. (Germany, Nov. 5, '32.) 30798.

ORGANIC BISMUTH COMPOUNDS, manufacture.—I. G. Farbenindustrie. Nov. 8. (Germany, Nov. 8, '32.) 31142.

ORGANIC MERCURY COMPOUNDS, manufacture.—Imperial Chemical Industries, Ltd., and H. E. Parker. Nov. 3. 30628.

CONDENSATION PRODUCTS of acetylene, production.—Imperial Chemical Industries, Ltd., and W. Mitchell. Nov. 7. 30992.

COMPOSITIONS OF RUBBER, production.—International Latex Processes, Ltd., and E. A. Murphy. Nov. 8. 31050.

DIARYLAMINES, manufacture.—E. Mather, Monsanto Chemical Works, Ltd., and D. D. Stokes. Nov. 2. 30516.

HYDROCARBONS, conversion and coking.—A. L. Mond and Universal Oil Products Co. Nov. 8. 31160.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

QUOTATIONS in the home chemical market remain steady generally, and there has been a fair amount of activity during the week. The prices of industrial chemicals are firm, and there has been a further improvement in the lithopone market. Sodium sulphide is in better demand, and there has been a fair inquiry for hydrochloric acid, anhydrous ammonia and ammonium chloride. Amongst wood distillation products, there has been an increase in the price of all grades of acetate of lime and a slight reduction in the price of charcoal. Recent increases in the prices of coal tar products have been maintained, and there has been a further rise in 90 per cent. toluol. The decline in the value of the dollar has resulted in low offers for American pitch. Th only change of note in pharmaceutical chemicals has been a reduction in the price of recrystallised menthol. Somewhat irregular conditions have prevailed in the essential oils market.

LONDON.—Prices remain firm generally with a good steady demand. The coal tar products market is firm.

MANCHESTER.—The continued weakness of the non-ferrous metals is a disturbing influence on values of a number of chemical products, but in most other respects the price position on the Manchester market during the past week has been steady generally, with, however, the depreciated dollar also exercising its effect on the quotations for imported products. The demand for a number of the principal soda, potash, and ammonia products this week has been fairly steady, and there has been a moderate movement in the acid section. Consumers are showing fair interest in contract commitments and several orders for forward delivery have been reported here. Among the by-products, the market for pitch so far as new bookings are concerned, is flat, and, according to reports current here during the past few days, although many of the light products still meet with an active demand, there is evidence that the high prices reached, in the toluols, for instance, are now tending to discourage buyers.

SCOTLAND.—Steady business is taking place in the Scottish heavy chemical market and prices for contracts over 1934 will generally be fixed before the end of the current month.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80% £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—SCOTLAND: Granulated commercial, £26 10s. per ton; B.P. crystals, £35 10s.; B.P. powder, £36 10s. in 1-cwt. bags d/d free Great Britain in 1-ton lots upwards.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K

ACID, CITRIC.—LONDON: 9½d. per lb.; less 5%. MANCHESTER: 9½d.

ACID, CRESYLIC.—97/99%, 1s. 1d. to 1s. 7d. per gal.; 98/100%, 1s. 5d. to 2s.

ACID, FORMIC.—LONDON: £47 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £49 to £52 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—Average prices f.o.r. British makers' works, with slight variations owing to local considerations; 140° Tw. crude acid, £3 per ton; 168° Tw. arsenical £5 10s.; 168° Tw. non-arsenical, £6 15s. SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. 0½d. per lb. LONDON: 11½d. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 1s. 0½d.

ALUM.—SCOTLAND: Lump potash, £9 per ton ex store.

ALUMINA SULPHATE.—LONDON, £8 5s. to £9 10s. per ton. SCOTLAND: £8 to £8 10s. ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £32 per ton; powdered, £34, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £19 to £20. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £17 c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 10s. at mines.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot 35/37% £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 15s. in 5/6 cwt. casks.

BORAX, COMMERCIAL.—Granulated, £15 10s. per ton; powder, £17 packed in 1-cwt. bags, carriage paid any station Great Britain. Prices are for 1-ton lots and upwards.

CADMIUM SULPHIDE.—2s. 7d. to 2s. 11d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3½d. to 5d. per lb.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K. Green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. per lb. Liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £3 19s. per cwt.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £28 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34 to £36; brown, £32

LEAD NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £25 10s. to £28 per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground Calcined £9 per ton ex store.

METHYLATED SPIRIT.—61 O.P. Industrial 1s. 8d. to 2s. 3d. per gal. Pyridinised Industrial, 1s. 10d. to 2s. 5d. Mineralised, 2s. 9d. to 3s. 3d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—9d. to 10d. per lb. without engagement.

POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £40 to £41.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5¼d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM NITRATE.—SCOTLAND: Refined Granulated £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¾d. to 9d. per lb. SCOTLAND: B.P. crystals, 8½d. MANCHESTER: Commercial, 8¼d. B.P., 9d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. to 8¾d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8¼d.

SALAMMONIAC.—First lump spot, £42 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags, special terms for contracts.

SODA, CAUSTIC.—Solid 76/77° spot, £14 5s. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 15s. in

casks, Solid 76/77%, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 10s. contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 10s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. with discounts for quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts. MANCHESTER: 4d. less 1 to 3½% contracts, 4d. spot lots.

SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 per ton.

SODIUM CHROMATE.—3¾d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.

SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£12 10s. per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND 5d. to 5¾d. ex store. MANCHESTER: 4¾d. to 5¾d.

SODIUM SILICATE.—140° Tw. Spot £8 5s. per ton d/d station, returnable drums.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground Spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £15 5s. to £15 10s. per ton f.o.b.

SULPHUR.—£11 per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 3d. to 4s. 5d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON AND SCOTLAND: £12 per ton.

ZINC SULPHIDE.—11d. to 1s. per lb.

Pharmaceutical and Fine Chemicals

BISMUTH SALTS.—Carbonate, 7s. 8d. per lb.; citrate, 10s. 3d.; nitrate (cryst.), 5s. 4d.; oxide, 12s.; salicylate, 8s. 7d.; subchloride, 11s. 8d.; subgallate, 8s. 2d.; subnitrate, 6s. 9d.

MENTHOL, A.B.R. recryst, B.P.—12s. 6d. per lb.

Essential Oils

LAVENDER, MONT BLANC.—38/40%, 18s. 6d. per lb.

LEMONGRASS.—4s. 6d. per lb.

PEPPERMINT, JAPANESE.—4s. 3d. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 9d. to 10d. per lb.; crude, 60's, 2s. 5d. to 2s. 6d. per gal. MANCHESTER: Crystals, 9d. per lb.; crude, 2s. 6d. per gal. SCOTLAND: 60'7, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 6d. to 1s. 9d. per gal.; pale, 98%, 1s. 4d. to 1s. 5d.; pale 95%, 11d. to 11½d.; dark, 10d., all according to specification; refined, 1s. 8d. to 1s. 9d. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; 97/99%, 1s. to 1s. 1d.; dark, 97/99%, 11d. to 1s.; high boiling acid, 2s. 6d. to 3s.

ANTHRACENE OIL.—Strained, 4½d. per gal.

BENZOL.—At works, crude, 10d. to 10½d. per gal.; standard motor 1s. 5d. to 1s. 5½d.; 90%, 1s. 6d. to 1s. 7d.; pure, 1s. 8½d. to 1s. 9d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d. to 1s. 7½d.; 90%, 2s. 0½d. to 2s. 1½d.

CREOSOTE.—B.S.I. Specification standard, 3d. to 3½d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3d. to 3½d. f.o.r. North; 4d. to 4½d. London. MANCHESTER: 3d. to 4½d. SCOTLAND: Specification oils, 3½d. to 4d.; washed oil, 3½d. to 4d.; light, 3½d.; heavy, 4½d. to 5d.

NAPHTHA.—Solvent, 90/160%, 1s. 4d. to 1s. 5d. per gal.; 95/160%, 1s. 8d. to 1s. 9d.; 99/190%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, Hot-Pressed, £6 1s. 3d. per ton. Flaked £10 per ton. Purified crystals, £9 15s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, £3 15s. per ton. SCOTLAND: £3 15s. to £4 f.o.b. Glasgow. MANCHESTER: £3 12s. 6d. to £3 17s. 6d. f.o.b. LONDON: £3 15s. f.o.b. East Coast port for next season's shipment.

PYRIDINE.—90/140, 5s. to 5s. 6d. per gal.; 90/180, 2s. to 2s. 6d. SCOTLAND: 90/160%, 4s. to 5s.; 90/220%, 1s. 9d. to 2s. naked.

REFINED COAL TAR.—SCOTLAND: 4d. per gal.

TOLUOL.—90%, 2s. 9d. to 2s. 10d. per gal.; pure, 3s. 3d.

XYLOL.—Commercial, 2s. 9d. to 2s. 10d. per gal.; pure, 3s.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £10. Grey, £16 to £17. Liquor, brown, 30° Tw., 7d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £16.

ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.

AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.

CHARCOAL.—£6 10s. to £10 per ton.

WOOD CREOSOTE.—6d. to 2s. 6d. per gal., unrefined.

WOOD NAPHTHA, MISCIBLE.—3s. to 4s. per gal. Solvent, 3s. 9d. to 4s. 9d. per gal.

WOOD TAR.—£2 10s. to £6 per ton.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Home, £6 17s. 6d. per ton; export, £6 10s. f.o.b. U.K. ports in single bags.

CYANAMIDE.—£7 1s. per ton, carriage paid to railway station.

NITRATE OF SODA.—£7 11s. per ton nearest station.

NITRO-CHALK.—£7 5s. per ton nearest station.

CONCENTRATED COMPLETE FERTILISERS.—£10 15s. to £11 6s. per ton according to percentage of constituents.

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton according to percentage of constituents.

Latest Oil Prices

LONDON, Nov. 22.—LINSEED OIL was quieter. Spot, £19 15s. (small quantities 30s. extra); Dec., £18 7s. 6d.; Jan.-April, £18 12s. 6d.; May-Aug., £18 17s. 6d., naked. RAPE OIL was inactive. Crude extracted, £27; technical refined, £28 10s., naked, ex wharf. COTTON OIL was dull. Egyptian, crude, £14 10s.; refined common edible, £17 10s.; and deodorised, £19, naked, ex mill (small lots 30s. extra). TURPENTINE was steady. American spot, 41s. 9d. per cwt.

HULL.—LINSEED OIL, spot, quoted £19 5s. per ton; Nov., £18 15s.; Dec., £19; Jan.-April, £19 2s. 6d.; May-Aug., £19 7s. 6d. COTTON OIL, Egyptian, crude, spot, £14 15s.; edible, refined, spot, £17 5s.; technical, spot, £17 5s.; deodorised, £19 5s., naked. GROUNDNUT OIL, extracted, spot, £21 10s.; deodorised, £25 10s. PALM KERNEL OIL, crude, f.m.q., spot, £17, naked. RAPE OIL, extracted, spot, £26; refined, £27 10s. SOYA OIL, extracted, spot, £20; deodorised, £23 per ton. COD OIL, 21s. per cwt., nominal. CASTOR OIL, pharmaceutical, 37s.; first, 32s.; second, 29s. per cwt. TURPENTINE, American, spot, 44s. 6d. per cwt.

Steam Pipe Installation

DESIGN and practice in steam pipe installations have advanced so rapidly since Stewarts and Lloyds, Ltd., of Glasgow, Birmingham and London, issued their steam pipe installation catalogue in 1925 that it has been necessary to prepare what is practically a new catalogue in order to bring it into line with modern conditions. The 1933 edition of the catalogue is an excellent production of 160 pages. It contains the information regarding the firm's products required by those interested in the design, erection or maintenance of steam pipe installations, comprising a detailed material specification, tables of thicknesses of steel tubes and cast steel fittings for pressures up to 1,400 lb. per sq. in., and temperatures up to 900° F., also British Standard Flange Tables 'D' to 'T.' In addition, particulars are given of the expansion of steam pipes, of the travels and reaction thrusts of expansion bends, and of the dimensions and weights of both tubes and fittings. Abridged steam tables and notes on the flow of steam in pipes, have been added.

From Week to Week

MR. THOMAS BROWN, said to be the oldest chemist in England, died at Grimsby at the age of 100.

ARTHUR BELL AND SONS, LTD., Perth, have purchased the assets of P. Mackenzie and Co. (Distillers), Ltd., which include Dufftown-Glenlivet Distillery and Blair Atholl Distillery, Pitlochry.

LORD MELCHETT lectured to the members of the Incorporated Accountants' London and District Society on "Accountancy Methods as a Factor in the Economic System," at Incorporated Accountants' Hall, London, on November 21.

THE ONE HUNDRED AND EIGHTH COURSE of Christmas lectures arranged by the Royal Institution and adapted to a juvenile auditory, will be given on December 28 and 30, and January 2, 4, 6, and 9. Sir James Jeans will be the lecturer, and his subject will be "Through Time and Space."

THE TWELFTH ANNUAL RE-UNION and dinner of "Q" Special Company, R.E., will be held at Anderton's Hotel, Fleet Street, London, E.C.4, on Saturday, January 6, 1934. Particulars may be obtained from the secretary, H. T. Islip, "Wayside," Iver, Bucks.

THE NORTHERN SECTION of the Coke Oven Managers' Association have elected Dr. S. W. Saunders chairman for the ensuing year, to succeed Mr. G. Harrison, of Derwenthaugh. Dr. Saunders is one of the most eminent chemical engineers in the industry, and is associated with the by-product plants of Imperial Chemical Industries, Ltd.

MR. W. OLDHAM, who has retired from the hon. secretaryship of the Mansion House Association on Transport, was presented with an inscribed clock and silver cigarette casket on November 17 in appreciation of his services for the past four years. The presentation was made by Sir Isidore Salmon, M.P., chairman of the parliamentary committee of the Association, at a luncheon in Mr. Oldham's honour at the Trocadero Restaurant.

THE UNIVERSITY SCIENCE FEDERATION, which groups together for scientific and social purposes the various societies in the faculties of science and technology, has persuaded Professor Frederick Soddy, of Oxford, to address its first meeting in the new session. Professor Soddy, who is a Fellow of the Royal Society and Lee's Professor of Inorganic and Physical Chemistry at Oxford, has chosen for his address in Manchester the provocative title "Science must lead."

THE WILLIAMS PRIZE of the Iron and Steel Institute has this year been awarded jointly to Mr. D. F. Marshall, of Sheffield, for his paper on "The External Heat Loss of a Blast-Furnace," which was presented at the last annual meeting of the Institute in London, and to Mr. A. Robinson, of Scunthorpe, for his paper on "Some Factors Leading to Greater Production from a Steel Furnace," which was presented at the autumn meeting of the Institute held in Sheffield in September last.

A CONTRACT FOR THE BULK SUPPLY of fuel oil made from British coal has been placed by the London, Midland, and Scottish Railway with Low Temperature Carbonisation, Ltd. This first contract, which is for 1,500 tons of fuel oil, is, it is stated, one of a number which have been placed by important industrial undertakings during the past two months. Large quantities of the fuel are already being consumed by the Sheffield steel industry in the manufacture of stampings and drop-forgings, and its use in furnaces specially designed for the manufacture of glass is rapidly growing.

LEWIS AND LEWIS, solicitors to Sir Ernest Benn, have received notice from the Nottingham Corporation of the discontinuance of the action for libel brought by the corporation against Sir Ernest Benn and the printers and publishers of "The Independent." The action arose out of the publication in an advance issue of "The Independent" of a page of letterpress and pictures criticising the public expenditure of Nottingham. The Nottingham Corporation has also paid Sir Ernest Benn's agreed costs. A dummy copy of "The Independent," published last September, contained a page headed "Spending for Employment," and using the new Nottingham Council House as an illustration of the argument that prosperity could not be promoted by the building of town halls. In his affidavit the Town Clerk of Nottingham said that the alleged libel meant "that the Council has adopted a spendthrift policy to the very great detriment and prejudice of the ratepayers in building luxurious and costly premises for their own accommodation, and neglected their duty to clear the slums to provide better dwelling houses for the poorer classes, that they have suppressed the old Goose Fair and the old Open Market, caused them to be moved to make room for the Council House and that in consequence these markets have been ruined, and that the result of the said spendthrift policy has been to impoverish the town and the ratepayers, exhaust their resources, and drive trade from the town."

SIR MAX MUSPRATT has been elected chairman of the Liverpool Public Assistance Committee.

THE DEATH IS ANNOUNCED of Mr. Charles O. Stillman, for fourteen years president of the Imperial Oil Co., of Canada. Mr. Stillman, who was seventy years of age, retired last June.

DR. F. H. GARNER, F.I.C., chief chemist of the Anglo-American Oil Co., has been nominated to fill a vacancy on the committee of the London and South Eastern Counties Section of the Institute of Chemistry.

PRELIMINARY EXPERIMENTS undertaken in Milan by C. Padovani and P. Franchetti have yielded encouraging results in the oxidation of methane to benzene in presence of a nickel catalyst at ordinary pressure. The success of the process will depend upon a cheap supply of pure, or almost pure, oxygen.

MR. H. J. JUDD, general sales manager of the United Glass Bottle Manufacturers, Ltd., has been appointed a director. A class meeting of the preference shareholders will be held in due course to fill the vacancy caused by the death of Mr. Gilbert Gilbey.

THE INSTITUTE OF PHYSICS, on November 14, elected the following to membership:—Fellows: P. D. Morgan, L. G. Vedy, T. B. Vinycomb, S. Whitehead. Associates: B. N. Clack, C. J. B. Clews, H. L. Penman, T. V. I. Starkey. Student Members: P. G. Forsyth, C. H. Garrett, F. Holliday, L. Starbuck, C. W. LeRoche Ward.

PROTEST MEETINGS are being held in two East Stirlingshire villages affected by the possible transfer of Nobel's explosives factories at Westquarter, near Falkirk and Linlithgow. These factories afford employment to approximately 1,000 workers, and the firm, an associate concern of Imperial Chemical Industries, have intimated the possibility of their eventually transferring activities at these two centres to Ardeer.

THE SCOTTISH BRANCHES of the Amalgamated Society of Dyers applied last June for new wages and conditions for their members in the West of Scotland. The union claimed a minimum of 1s. an hour for men and 8d. an hour for women, plus an all-round advance of 5s. a week for men and 3s. for women. The employers have acknowledged the application, but have not yet arranged the joint conference requested by the union.

THE PLAN FOR THE REFORM of the nitrate industry in Chile is warmly supported by the President, Dr. Arturo Alessandri. The Bill came before the Senate on November 21. Explaining the working of the Sales Corporation which is to be formed, the President stated that the new organisation will be an independent concern under a form of Government control. It will have power to lower the price of nitrate to the minimum, considering only production costs, in order to compete effectively with foreign fertilisers.

SPEAKING AT A LECTURE IN VIENNA, Dr. Carl Bosch emphasised an aspect of the coal and lignite hydrogenation policy which is apt to be overlooked. So far as can be judged by the known petroleum deposits and on the basis of the 1932 consumption, only about 20 years will elapse before natural petrol supplies are exhausted. By contrast, the known coal deposits are more or less inexhaustible. All countries deficient in petroleum but enjoying ample coal deposits should therefore be attracted by the possibilities of coal hydrogenation.

TWO ENGINEERS, V. Hybinette and J. C. Nicholls, have arrived at Helsingfors as representatives of the International Nickel Co. of Canada, to open negotiations with the Finnish Government regarding the grant of a concession for the working of the extensive nickel finds at Kaulatunturi, Petsamo, on the Arctic Coast of Finland. These representatives were in Finland last summer to investigate the finds, which, it is estimated, altogether contain about 1,400,000 tons of nickel and copper ore, the yield being 1.38 per cent. of nickel and 1.3 per cent. of copper.

Production of Fuller's Earth

WHILE the production of fuller's earth in the United States has increased almost phenomenally during the 38 years for which annual figures are available, declines were registered in 1931 and 1932. The quantity produced in 1932 was 252,902 short tons valued at $2,440,736, compared with 288,400 tons, valued at $3,055,570 in 1931, a decrease of 12 per cent. in total output and 20 per cent. in total value. Approximately 95 per cent. of all fuller's earth produced in the United States during the past 3 years has been used for decolourising mineral oils, and 5 per cent. has been employed in similarly treating vegetable oils and animal fats.

Company News

A. B. Fleming & Co.—An interim dividend of 5 per cent., less tax, is announced.

Shell Transport and Trading Co.—The directors have decided to declare no interim dividend for the year 1933.

Tehidy Minerals.—In respect of the year 1933 a dividend of 2½ per cent., less tax, is announced, payable on December 6.

W. and H. M. Goulding.—A dividend of 3 per cent., less tax, is announced on the ordinary shares, payable on December 30.

Reckitt & Sons, Ltd.—The usual quarterly dividend of 5 per cent. is announced on the ordinary shares, payable on January 1, which is to be carried forward to the new account.

Zinc Corporation.—An ordinary interim dividend of 5 per cent. on account of the current year, has been declared, payable, less tax, in English currency on January 1.

Dorman Long & Co.—The board decided on Tuesday not to recommend the payment of any dividend on the 6 per cent. cumulative preference shares for the year ended September 30, 1933. No payment has been made on the shares since 1930.

Deutsche-Amerikanische Petroleum-Gesellschaft.—This German distribution company of the Standard Oil Co. shows in its balance sheet for 1932 a loss of Rm. 5,555,000. Including a loss of Rm. 2,599,000 in 1931, the total deficit is now increased to Rm. 8,155,000.

The Powell Duffryn Steam Coal Co.—An interim dividend of 1½ per cent., less tax, is announced on the ordinary shares. This is the first such distribution since 1926, when 2½ per cent. was forthcoming. Payment of the dividend will be made on December 19.

National Smelting Co., Ltd.—The gross profits of this company, which is owned by the Imperial Smelting Corporation, Ltd., for the first six months of the current year amount to £73,393. For the whole of 1932, after charging £49,925 for depreciation, the gross profit was £92,430.

Wall Paper Manufacturers Co.—The gross profits for the year ended August 31,1933, amount to £635,055, compared with £608,148 for 1931-32. After the maximum payment of 10 per cent. on the ordinary shares, deferred stockholders will receive a final dividend of 7½ per cent., making 11½ per cent., against 10 per cent. in 1931-32.

Cross Bone Manure and Lime Co.—The net profit for the year ended June 30, after debenture interest and setting aside £546 for depreciation, amounts to £362, plus £715 brought in, making £1,077, which is carried forward. The directors advise that dividend be paid on this occasion.

Tate and Lyle, Ltd.—The directors announce a final ordinary dividend of 13 per cent., making 17 per cent., less tax, for the year to September 30, 1933, against 16 per cent. in the previous year. The sum of £50,000 is placed to general reserve, while £250,000 is written off plant and machinery, the carry-forward of £48,973 comparing with £65,112 brought in.

British Cotton and Wool Dyers' Association.—A net profit of £21,393 is announced for the half-year to September 30 last, against £28,452 a year ago. With the amount brought forward, the credit balance on profit and loss account is now £59,212. For the year to March 31, 1933, the net profit was £62,780, and the ordinary dividend 5 per cent.

British Goodrich Rubber Co.—The profit for the year ended September 30, 1933, subject to completion of audit, amounts to £109,165, after depreciation and debenture interest, but before making allowance for tax. This compares with £87,742 for 1931-32. The directors recommend a final ordinary dividend of 4 per cent., making 6½ per cent., less tax, against 5 per cent. in the previous year.

Eastwoods Lewes Cement Co.—A trading profit of £14,980 is shown for the year ended June 30, 1933. The net profit was £7,645, against £12,258 in the previous year, to which is added the amount brought forward of £3,772, making £11,417. The directors recommend final dividends at the rate of 5½ per cent., making 7½ per cent., on the ordinary shares and on the founders' shares, leaving to be carried forward £3,354.

Scottish Agricultural Industries, Ltd.—Dividends declared by subsidiary companies in respect of the year ended June 30 last totalled £35,973, and investment revenue received £218. A dividend of 6 per cent., less tax, has been paid on the preference shares, leaving £6,071 to be carried forward. The directors regret that it is impossible to recommend a dividend on the ordinary or deferred shares.

Unilever and Unilever N.V.—The boards on November 16 declared interim dividends payable on December 1, on their respective ordinary shares, which, in the case of the Dutch company, is Fl. 20—2 per cent.—on every share of Fl. 1,000. In accordance with previous practice, the £1 shares of the English company have been taken as equal to Fl. 12 each, so that the equivalent dividend on the English shares is the sterling value of 24 Dutch cents. per share. Converted at the rate of exchange on the day of declaration this is equal to 3 per cent.

Avon India Rubber Co.—In their report for the year to September 30, 1933, the directors give notice of an extraordinary meeting to increase the capital to £600,000 by the creation of 225,000 additional 6 per cent. cumulative preference shares of £1. Trading profit and fees, £80,543, compares with £90,016 in the previous year, and after depreciation, expenses, etc., a net balance of £36,804 is shown, against £46,593. The ordinary dividend is 8 per cent., against 6 per cent. in 1931-32. The carry-forward of £27,750 compares with £12,252 brought in. The annual meeting will be held at Bath Road, Melksham, on December 8, at 2.45 p.m.

British Cyanides Co.—The gross profit for the year to June 30, 1933, is £47,507, which is £12,370 higher than in 1931-32, while the net balance is up from £9,321 to £12,725, after allocating £4,412 written off Birmingham plant, £3,960 as a special obsolescence charge and £1,195 written off subsidiary advertising cost for previous years. After the payment of 3 per cent. on the ordinary shares, the first distribution since 1929-30, £5,000 is placed to reserve, and the balance of £2,573 carried forward. The annual meeting will be held at Southern House, Cannon Street, London, on November 29, at 12 noon.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Belgium.—An engineer established at Brussels wishes to obtain the representation, on terms to be arranged, of United Kingdom manufacturers of china clay, resinous soap for paper mills, paints and insulating varnish for the electrical industry. (Ref. No. 579.)

France.—An agent established at Paris wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of perfumery and toilet preparations, toilet articles and accessories. (Ref. No. 581.)

Spain.—An agent established at Barcelona wishes to obtain the representation of United Kingdom manufacturers of drugs and pharmaceuticals. (Ref. No. 586.)

Switzerland.—A firm established at Zurich wishes to obtain the representation, on a purchasing basis, of United Kingdom manufacturers of specialities in paints and varnishes, air purifying and conditioning apparatus. (Ref. No. 590.)

Forthcoming Events

Nov. 27.—Institute of Chemistry (Bristol Section). Joint meeting with the University Chemical Society. Lecture by C. F. Tompkins.

Nov. 27.—Institution of the Rubber Industry. Visit to the Imperial Institute, London, by invitation of the London Advisory Committee for Rubber Research (Ceylon and Malaya). 7 p.m.

Nov. 28.—Hull Chemical and Engineering Society. "Varnishes." H. R. Wood. 7.45 p.m. Grey Street, Park Street, Hull.

Nov. 28.—Annual Chemical Dinner. 7.30 p.m. Wharncliffe Rooms, Hotel Great Central, London.

Nov. 29.—Institute of Fuel (North-Western Section). Joint meeting with the Manchester Association of Gas Engineers. Address by Dr. E. W. Smith. 7 p.m. Engineers' Club, Manchester.

Nov. 29.—Royal Society of Arts. "A Theory of Colour Co-ordination." M. Sargant-Florence. 8 p.m. Royal Society of Arts.

Nov. 29.—Institution of Chemical Engineers. "The Mechanical Properties of Metals at Low Temperatures" Part II.—Non-Ferrous Metals. E. W. Colbeck and W. E. MacGillivray. 6 p.m. Burlington House, Piccadilly, London.

Nov. 30.—The Chemical Society. "The Revelations between Photochemical and Thermochemical Reactions." Professor A. J. Allmand. 7 p.m. Chemistry Lecture Theatre, University, Manchester.

Nov. 30.—The Chemical Society. "Some Modern Developments in Analytical Chemistry." J. B. Smith. 7.30 p.m. University, Sheffield.

Nov. 30.—The Institute of Metals (Birmingham Section). Symposium on Defects in Cold-Working. Arranged by A. L. Molineaux. James Watt Memorial Institute, Birmingham.

Dec. 1.—The Chemical Society. Lecture by Professor R. Robinson. 6 p.m. University College of North Wales, Bangor.

Dec. 1.—Society of Chemical Industry (Manchester Section). "The action of Caustic Soda on Certain Diazosulphonates derived from B-Napthol-1-Sulphonic Acid and the Constitution of the Products." Professor F. M. Rowe. 7 p.m. 17 Albert Square, Manchester.

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